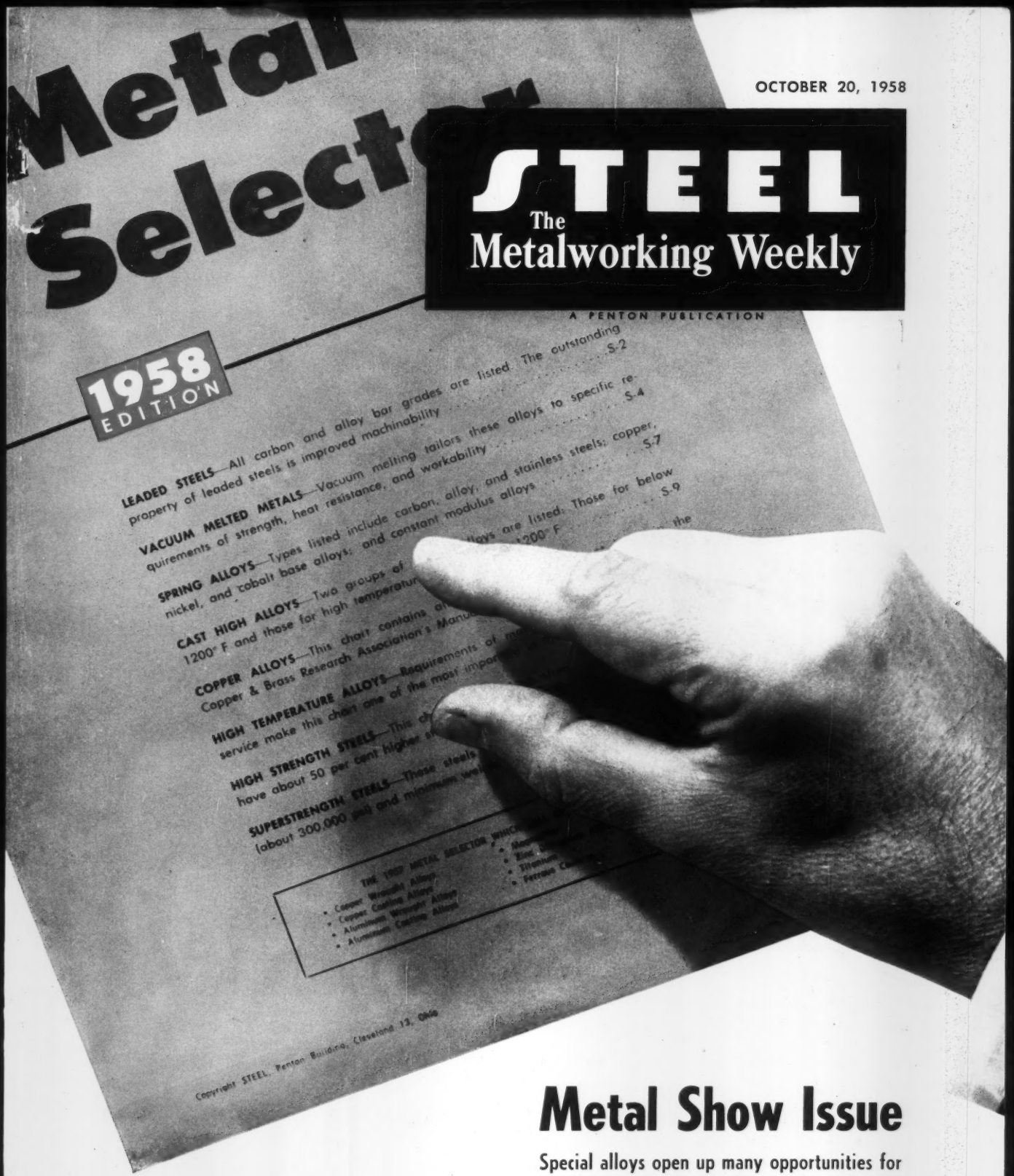
OCTOBER 20, 1958

STEEL
The Metalworking Weekly

A PENTON PUBLICATION



Metal Show Issue

Special alloys open up many opportunities for you to improve your profits

- Auto Suppliers Up Sights . . Page 125
- More Malleable Castings . . Page 295

CONTENTS — PAGE 5

it's mainly a matter of TIMING!

Q. ***WHEN should you replace a machine?***

A. ***When you can do it at a PROFIT!***

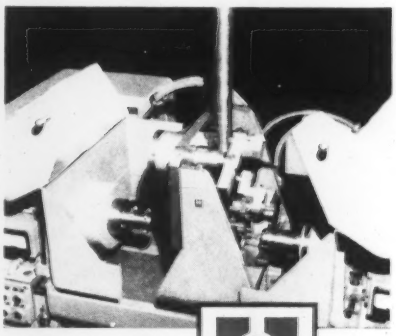
Obsolescence is an insidious thing. It can overtake any machine—even a relatively new one—without warning. And when it does, you're producing at a *loss*.

The only way to catch it in *time* is to make frequent studies, comparing the production cost of the old machine with that of the new one that might replace it. Then weigh these costs in terms of investment and return. Up to a certain point, the old machine will still be profitable to operate. Beyond that point, it's running *in the red*.

Heald sales engineers are well experienced in precise methods of replacement analysis. And they will be glad to help you determine when you can replace an existing machine *at a profit*. Similar cost studies by Heald engineers have pointed the way to many important cost savings.

For example: This new Heald Model 322 Bore-Matic replaced a heavy-duty drill for boring and chamfering hydraulic-cylinder piston rods. A cost analysis determined that the investment in a new machine could not be deferred any longer without serious financial loss. As verified by subsequent operation, the new machine offered the following savings:

	Old Machine	New Machine
Parts per hour	11	24
Machine load, per year	3,080 hrs.	1,380 hrs.
Direct & Indirect Labor	9,480 hrs	3,240 hrs.
Annual Maintenance	$356	$100
Annual Operating Cost	$27,800	$15,000
Annual Saving, New Machine		**$12,800**
Net Return on Investment		39.6%



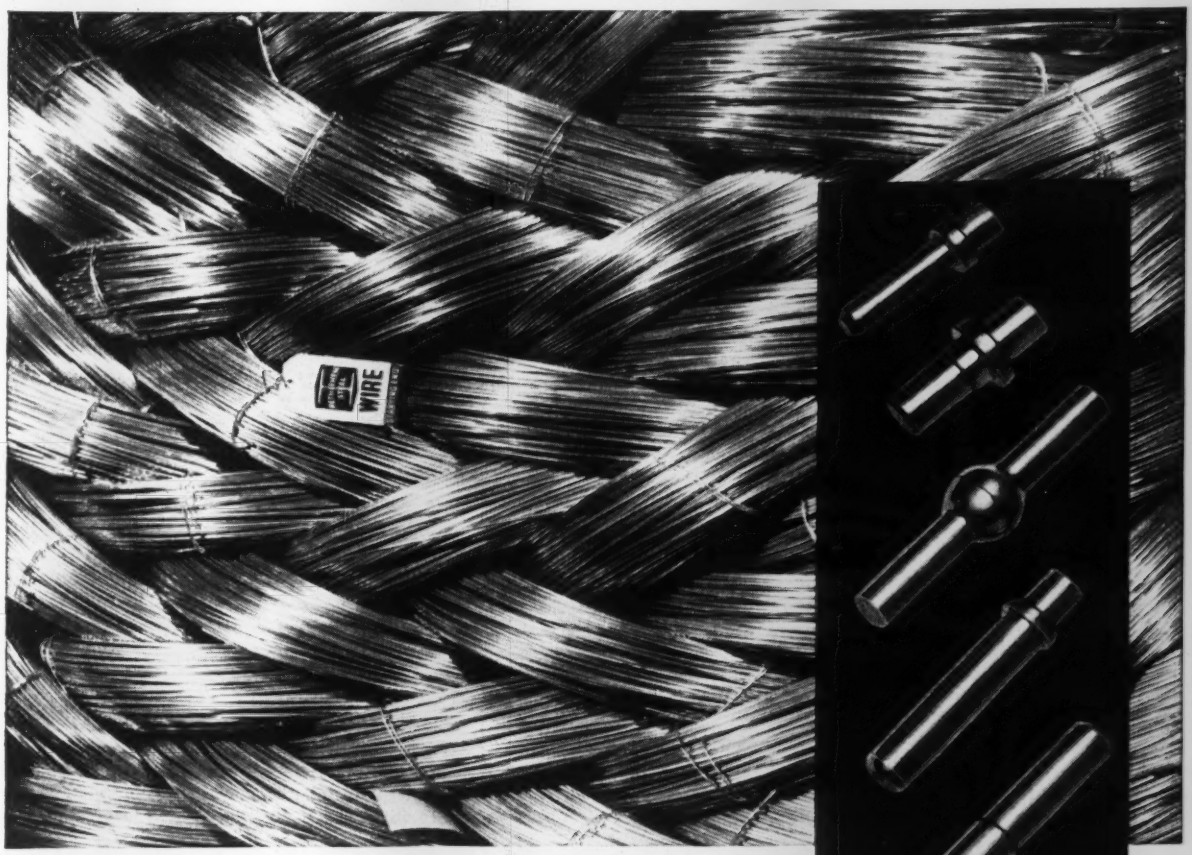
YOU pay for obsolescence. Replacement pays for itself!

THE HEALD MACHINE COMPANY

Subsidiary of The Cincinnati Milling Machine Co.

Worcester 6, Massachusetts

Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York



How to be sure you're using the right cold-heading wire

It pays to be fussy about the grade of cold-heading wire you use in operations like upsetting, forging or roll-threading. The job is half licked when you start with the correct type of steel wire.

Steel wire for cold-heading is a Bethlehem specialty. There are many ways in which our experience might prove helpful in bettering your production of cold-headed items.

At your invitation we will gladly study your products, equipment and process . . . and recommend the grade of steel that will perform the best. Then we'll carefully produce the steel to meet your needs.

Bethlehem cold-heading-quality wire is made to rigid standards. It is uniform in analysis and free from injurious surface defects. Thorough inspection at every stage of production typifies the quality-control that's behind every ton we ship.

One of our technical men will be glad to discuss cold-heading with you—or any other application of steel wire. Bethlehem makes nearly all kinds of steel wire. Just phone the nearest Bethlehem sales office, or drop a line to the address below.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

Leaders of the Mallory-Sharon technical team *(l. to r.) Lee S. Busch, Technical Director; Frank H. Vandenburgh, President; Graham B. Brown, Vice President, Marketing; Dan E. Cribbs, General Manager, Wrought Products Division.*

Take a new look at this

SPECIAL METALS TEAM

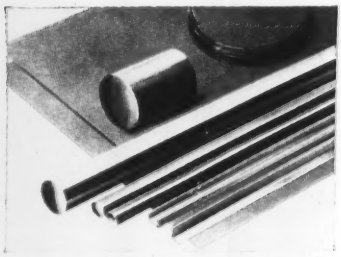
A whole new family of metals has come "of age" in the past decade. Titanium and zirconium already have progressed from expensive rarities to practical materials of construction. Other special metals will soon join them.

Looking for a fast-moving, on-its-toes "team" to assist you on special metals applications? Mallory-Sharon, largest integrated special metals producer, offers you just such a team. Within one organization, we control production from raw materials to finished mill products. Our entire experience and facilities, backed by a strong Service Engineering group, are devoted to special metals research and application.

To put this team to work for you, just write us about your needs or applications.

Research—*Microphotograph equipment for studying metallurgical grain structures. Mallory-Sharon is currently working on various government research projects, in addition to its own constant research and testing.*

Sponge Production—*Zirconium tetrachloride, delivered in these huge 6-ton rubber containers, is processed into zirconium sponge or platelets at Mallory-Sharon's modern sponge plant in Ashtabula, Ohio.*

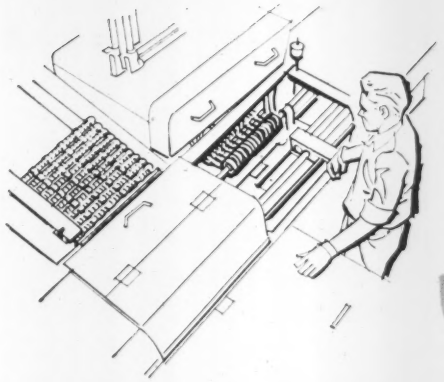


Mill Products—*Both titanium and zirconium are available from Mallory-Sharon in sheet, strip, rod, bar, plate and other shapes. All are closely quality-controlled as to mechanical properties and chemical composition.*

MALLORY MS SHARON

MALLORY-SHARON METALS CORPORATION · NILES, OHIO

Integrated producer of Titanium • Zirconium • Special Metals



17 Selected Areas Heated to 1650° F. in...

Just 10 Seconds

with TOCCO* *Induction Hardening*

A leading automobile manufacturer uses TOCCO Induction Heating for the tough, precision job of hardening camshafts. Material is high alloy cast iron. Minimum hardness obtained is 57 Rockwell C. Heating time is just 10 seconds per shaft. Production is 360 camshafts per hour. Take a look at these advantages:

1. TOCCO's localized heating means a minimum of distortion—far less than if the entire shaft were heated by other methods.
2. Obviously, the power cost is less than if the entire camshaft were heated.
3. TOCCO's automated process, with precise control, permits far less inspection than conventional methods—far fewer rejects.
4. TOCCO is cleaner and cooler, provides much better working conditions.

Even though you don't manufacture camshafts, look to TOCCO for your tough metal-heating jobs. Hardening, annealing, brazing, soldering, melting, heating for forging or forming—all can be done better, faster and at lower cost with modern, automatic TOCCO Induction Heating.

THE OHIO CRANKSHAFT COMPANY

Mail Coupon Today—NEW FREE Bulletin

The Ohio Crankshaft Co. • Dept. S-10, Cleveland 5, Ohio

Please send copy of "Typical Results of TOCCO Induction Hardening and Heat Treating."

Name_____

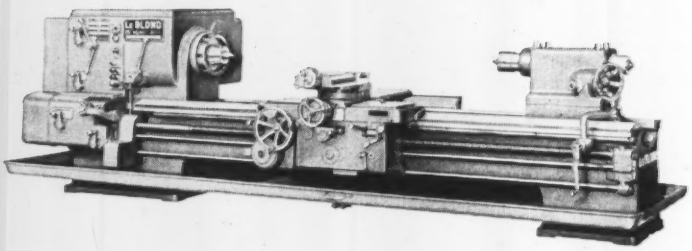
Position_____

Company_____

Address_____

City_____ Zone____ State_____

THE RUGGEDEST LATHES IN EVERY CLASS YOU'LL FIND IN THE LINE OF LeBLOND



This is the LeBlond 25″ heavy duty lathe — stamina plus, with precision. LeBlonds are famous for their ability to stand up to the toughest turning — year after year after year. Sound engineering is the reason, dependable performance is the result. Write for your LeBlond Complete Line Catalog No. C-58.

THE R. K. LeBLOND MACHINE TOOL CO.
CINCINNATI 8, OHIO

World's Largest Builder of A Complete Line of Lathes for More Than 71 Years

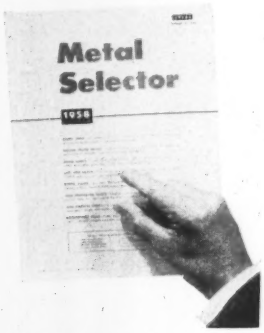
This Week in STEEL The Metalworking Weekly

October 20, 1958
Vol. 143 No. 16

EDITORIAL 123

Space age metals will bring new benefits as they are adapted for everyday use. And competition will speed such applications.

SPECIAL FEATURE 165



STEEL's Metal Selector for Special Alloys, 1958 edition, covers 16 pages in this issue. It lists: Leaded steels, vacuum melted metals; spring, cast high, copper, and high temperature alloys; high strength and superstrength steels.

WINDOWS OF WASHINGTON 132

Defense Department may be called upon to pull federal highway program out of the fiscal mud.

MIRRORS OF MOTORDOM 139

Studebaker-Packard bets nearly $17 million worth of tooling on success of Lark as it fights for survival.

THE BUSINESS TREND 143

Industrial production rises to new '58 peak despite persistent labor troubles in the auto industry.

WHERE TO FIND—

Behind the Scenes 6
Letters to the Editors 10
Editorial & Business Staffs .. 16
Calendar of Meetings 23
Men of Industry 147
New Products 273
New Literature 290
Advertising Index 322

Business— METALWORKING OUTLOOK 119

☑ Auto Suppliers Gage Detroit Optimism—They find it solid 125
Gray Iron Fights for Auto Markets and New Uses 127
Russian Steelmakers See "Little That Is New" in U. S. 128
Republic Steel's Patton Tells How To Attract Industry 129
Plastic Pipe Gets Big Play—Record sales year in prospect 130
The Ladies Speak About Appliances—They want better service .. 131
☑ Suppliers Can Help You Trim Costs via Value Analysis 135
Small Firms Can Act Faster—Little tool builder proves it 136
U. S. Needs Labor Laws Now, Senator Mundt Tells Employers .. 137
R&D Maintain High Ratings—Survey shows outlays increasing .. 153

Metal Show Section— ASM PROGRAM 201

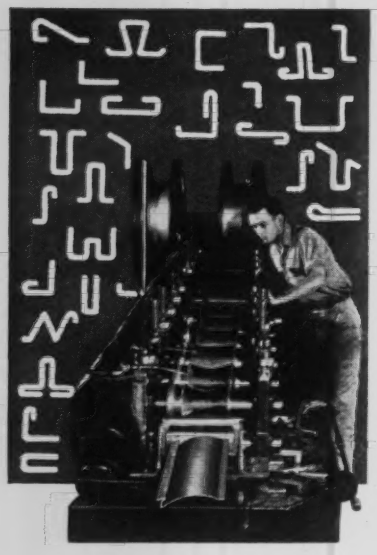
Frontispiece—40th National Metal Exposition & Congress 157
☑ Special Alloys Boost Metalworking's Future 158
☑ Metal Selector—1958 Edition 165
Progress in Steelmaking—Width Meters Trim Strip Waste 182
Vacuum Casting Tames Supermetals—Method has wide potential 191
Foundry Saves $29,448 a Year—Cost Crisis Competition entry 198

Markets— MARKET OUTLOOK 293

Complete Index to Market News and Prices 293
☑ Malleable Casting Sales Move Up—Pickup gaining strength 295
Steelwork Operation Chart and District Ingot Rates 302
Steel Production Rises—September best month so far in '58 302
Scrap Fluctuates in Narrow Range 315
Nonferrous Metals—Some Prices Continue Up 318

STEEL, the metalworking weekly, is selectively distributed without charge to qualified management personnel with administrative, production, engineering, or purchasing functions in U. S. metalworking plants employing 20 or more. Those unable to qualify, or those wishing home delivered copies, may purchase copies at these rates: U. S. and possessions and Canada, $10 a year; all other countries, $20 a year; single copies, 50 cents. Metalworking Yearbook issue, $2. Published every Monday and copyright 1958 by The Penton Publishing Co., Penton Bldg., Cleveland 13, Ohio. Accepted as controlled circulation publication at Cleveland, Ohio.

Index available semiannually. STEEL is also indexed by Engineering Index, 29 W. 39th St., New York 18, N. Y.



With a YODER . . .
ONE MAN PRODUCES
30,000 FEET OF
SHAPES A DAY!

Cold-roll forming with a Yoder Roll-Forming machine makes spectacular production possible in many metalworking applications and industries.

A multitude of shapes, simple or complex, produced from a wide variety of coated or uncoated stock, and destined for a virtually endless list of purposes, can be easily, quickly and economically produced with a Yoder cold-roll forming machine.

Whether it be moldings, structurals, siding, roofing, tubulars, cabinet shells, or any one of a thousand requirements, it can be quickly produced with accuracy and uniformity the Yoder way. The conversion cost is usually so low that even part-time operation makes a Yoder cold-roll forming line a profitable investment.

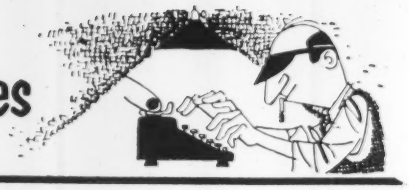
A great many modifications of the basic shape such as welding, coiling, ring forming, notching, perforating, embossing and cutting to length, can be simultaneously introduced with little or no additional labor cost. It will pay you big dividends to fully investigate the advantages of Yoder cold-roll forming. A fully-illustrated, 88-page book clearly discusses every important aspect of this amazingly versatile method of metal fabrication... it is yours for the asking.

THE YODER COMPANY
5502 Walworth Ave. • Cleveland 2, Ohio

ENGINEERING YODER MANUFACTURING
COLD ROLL FORMING MACHINES

Visit Booth 2770, Metal Show
Cleveland, Ohio, October 27-31

behind the scenes



Welcome Metal Show

A week from today, the National Metal Congress & Exposition will move into Cleveland's Public Auditorium and metalworking people from all over the world will move in with it. The foregoing statement is not wholly correct, of course. The Congress and the Exposition and people will move in before next Monday, because if they don't, there's going to be the most stupendous mix-up you ever saw when exhibitors, machines, equipment, and guests all try to enter first thing Monday morning.

We asked Associate Managing Editor Vance Bell why STEEL comes out with a National Metal Congress & Exposition Issue a full week before the fact. Mr. Bell rebuked us. "Don't you realize that STEEL is more concerned with the future than it is with the past?" he asked. "I suppose if you had your way, you'd wait until the show was over, and then write a news report about it. By that time, however, the whole thing would be old hat."

This special issue, then, is intended to prime you for the show. The technical section of the magazine is divided into seven parts, and each part is so yummy, from a metalworking standpoint, we scarcely know where to begin. Let's see: Shall we look at vacuum induction casting? Or the program? Perhaps we should settle on STEEL's Metal Selector for Special Alloys.

Metal Selector Awesome

The Metal Selector begins on Page 165, and runs 16 pages. In the planning stage, it was supposed to be a foldout, but when calculations revealed that it would hang out a little more than 5 ft, the editors reversed themselves. Associate Editor Austin Brant was in charge of the project. For weeks, he stumbled about the building, trailing reams of copy and revised copy, wondering if he had attributed C 0.30 to Lapelloy, or to Lapelloy "C"; there is a difference of 0.10, you know, and Austin didn't care to have metallurgists the world over pointing their collective finger at him.

We looked over a set of early proofs with the idea of filching something startling and interesting from them for presentation here, but we couldn't concentrate. An attempt to count the metals selected for this Metal Selector fizzled before we got to the fourth page. Take our word; there are oodles of them. There's something reassuring about numbers, so we approached Editorial Assistant Jane Wedge. Jane devoted many hours to STEEL's Metal Selector; she had typed much of the corrected copy, and had read proofs until her pretty blue eyes were in danger of floating out of her head.

"We listed 595 metals," she explained. "They fill 15 pages; when we couldn't get them in right side up, we put them in sideways."

"How did you ever arrive at the figure 595?"

"After I counted them," she said blandly. "I took the total and divided it by 1."

Endless Combinations

The chore of listing useful alloys is one that would shake a conscientious metallurgist. Combinations multiply like yeast cells, the progression of numbers, or the possibilities of moves in chess. The American Society for Metals defined an alloy in 1939: "A substance having metallic properties, consisting of two or more metallic elements, or of metallic and nonmetallic elements, which are miscible with each other when molten, and have not separated into distinct layers when solid."

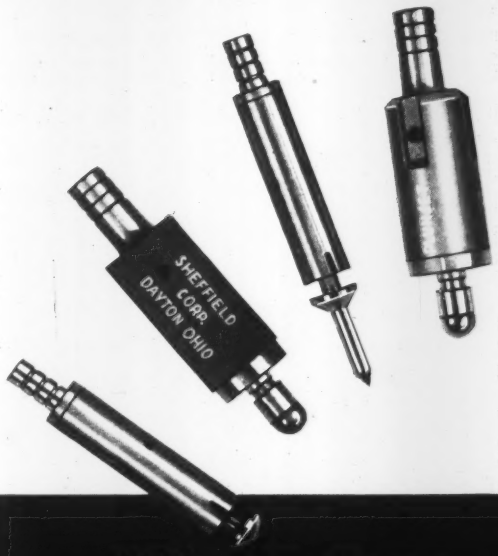
That gives modern alchemists a lot to play with, considering all the elements at their disposal, plus the new elements that will become available through atomic research. At the close of World War II, it was estimated that more than 5000 alloy compositions were in general use. How many are in use today? Perhaps even Jane Wedge couldn't count them.

Try thinking along these lines: Basically, there are three colors—red, yellow, and blue. By mixing and cross-mixing these originals, every color in the world can be reproduced; every color, tint, shade, hue, and nuance. Now, how many elements are there in circulation today? Ninety-six? How many of these are metallic? By mixing and cross-mixing these originals, how many alloys are possible?

When the National Metal Congress meets, some of the boys are sure to introduce new recipes for new alloys; likewise, sure as shootin', Austin Brant will be there taking notes for STEEL's 1959 Metal Selector.

Shirdlu

(Metalworking Outlook—Page 119)



GET 32 PAGES OF NEW TECHNICAL DATA ON AIR GAGING

"Where and How to Use Plunjet Air Gaging Cartridges"

A new 32 page handbook will prove invaluable to the gage designer, process engineer and all others concerned with air gaging:

Write for Your Copy Today!

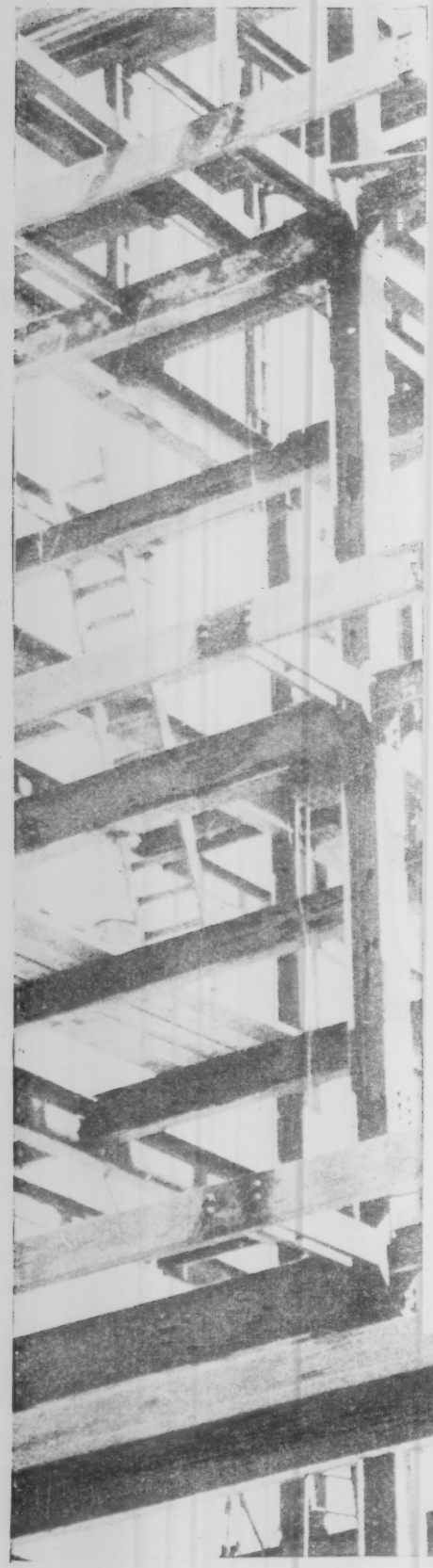
Only Sheffield PLUNJETS are available in a sufficient variety of styles, ranges and amplifications to adequately serve today's broad scope of air gaging needs. Because of their flexibility and adjustability, they are the practical answer to the gaging of long runs, short runs, to meet unexpected engineering changes and for emergency close-tolerance gaging requirements.

Write today for this comprehensive handbook to The Sheffield Corporation, Dayton 1, Ohio, U.S.A., Dept. 17.

the SHEFFIELD corporation
of Bendix Aviation

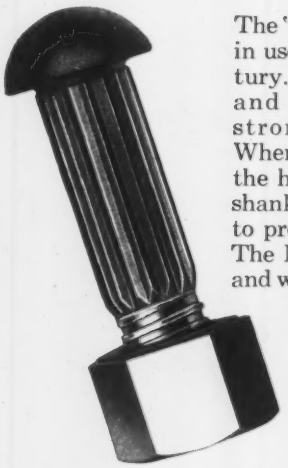
manufacture and measurement for mankind

8049



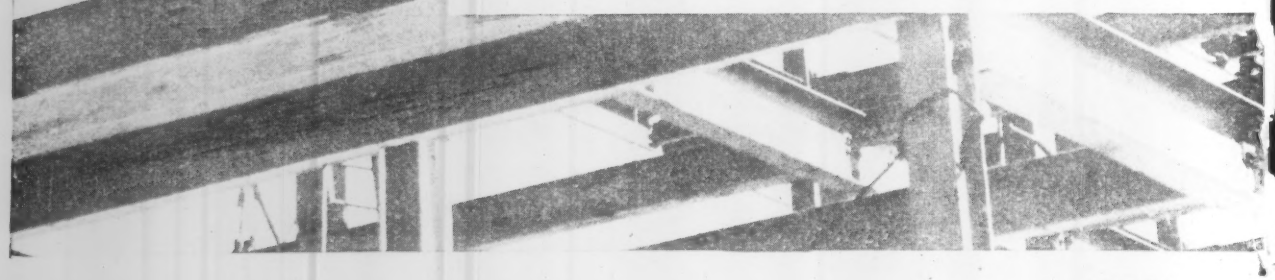
Lamson has

LAMSON
Dardelet Rivet Bolt

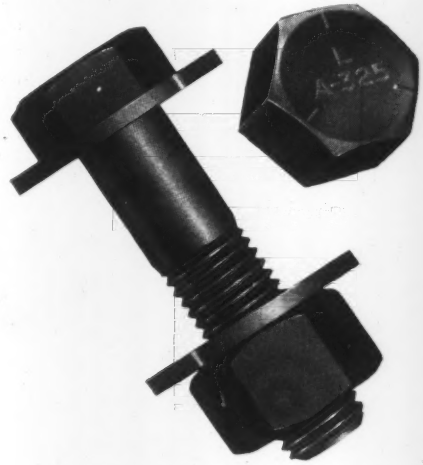


The "original" structural bolt in use for over a quarter century. It requires only a maul and wrench to produce a strong, tight connection. When the bolt is driven into the hole, the oversize ribbed shank splines are deformed to provide a body-bound fit. The Dardelet nut is spun on and when tightened, the locking threads of the nut and bolt provide a positive locked connection that can only be backed off with a wrench. No washer is required.

These Lamson structural fasteners are distributed by 19 United States Steel Supply Division Steel Service Centers in key locations throughout the country.



all three top performing structural bolts and nuts



LAMSON

High-Strength Structural Bolt

The A-325 and three radial marks on the head are the identification that this high-carbon structural bolt meets or exceeds rigid ASTM specifications. The "L" on the head identifies it as a genuine Lamson & Sessions bolt. Always look for these identifying marks and you'll always be sure you are getting genuine ASTM approved structural fasteners. This bolt is used with two washers and a nut made of high carbon steel to ASTM requirements.

LAMSON

Structural Nut

This is the nut that is used with both the Lamson High-Strength Bolt and the Lamson High-Tensile Bearing Bolt. The three long indented arcs on each end of the nut indicate that it meets or exceeds ASTM specifications. The short dashes inbetween the arcs identify it as a genuine Lamson nut.

LAMSON High-Tensile Bearing Bolt *

This new bolt assembly, made to ASTM A-325 specifications, is superior to, yet costs no more than Standard High-Tensile or Dardelet Structural assemblies. It is particularly well adapted for use in structures subject to dynamic or reversed stress loading and can be readily assembled by one man with conventional tools and equipment. It has high shear and bearing values because its knurled body fills the hole to make a joint in initial bearing. This body-bound feature, plus high strength characteristics eliminates the possibility of slip in joints and provides added rigidity and stability in the structural connection. Only one washer is required with the High-Tensile Bearing Bolt.

* PATENT APPLIED FOR

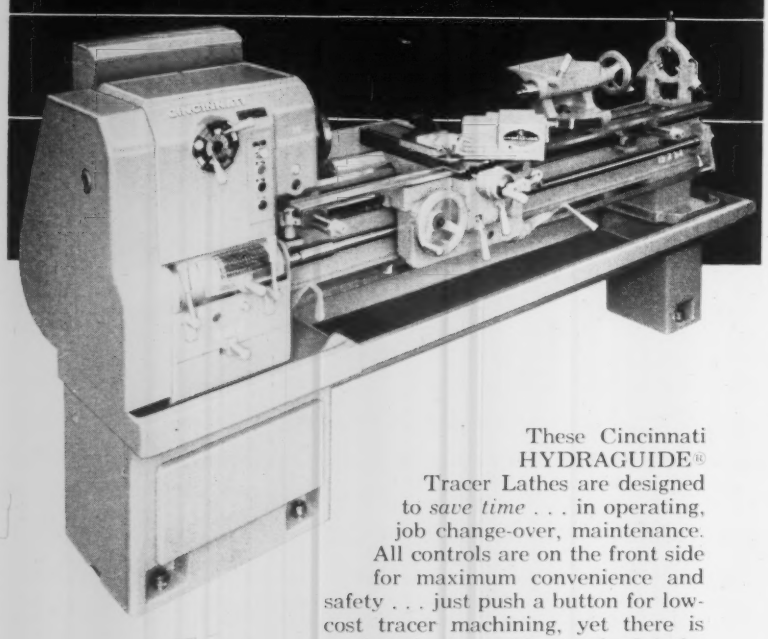
The Lamson & Sessions Co.

5000 Tiedeman Road • Cleveland 9, Ohio

Plants at Cleveland and Kent, Ohio • Chicago • Birmingham

L&S

when
TIME
means
the
order...



These Cincinnati HYDRAGUIDE® Tracer Lathes are designed to *save time* . . . in operating, job change-over, maintenance. All controls are on the front side for maximum convenience and safety . . . just push a button for low-cost tracer machining, yet there is no interference with standard lathe operation. No extra floor space is required . . . everything is on the carriage, yet nothing is in the way.

And, economy-priced Cincinnati Lathes are husky and versatile enough to handle some of the jobs that often tie up heavy-duty machines.

Do you have the new booklet, "How to Determine if a Lathe will be a Money-Maker"? See your CL&T Dealer, or write us direct.

Improved Machining Through Research

CINCINNATI LATHE AND TOOL CO.

3210 Disney Street • Cincinnati 9, Ohio

"TRAY-TOP" Lathes • "CINCINNATI" Drilling Machines
"SPIROPOINT" Drill Sharpener

LETTERS
TO THE EDITORS

Series: Constructive Effort

I have followed your 1958 Program for Management series with a great deal of interest. It is an extremely thoughtful and constructive effort.

I note in your Sept. 22 issue that extra copies are available. Since we have four marketing managers in our company, I would like several extra copies of each of the articles.

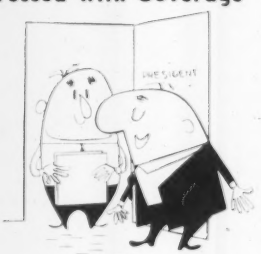
Ogden W. Sutro
Director of Sales & Marketing
Malleable Iron Fittings Co.
Branford, Conn.

30 Reprints of Three Articles

In the Sept. 15 issue, you had several interesting articles: "The Steel Industry" (Page 149), "The Changing Look of Steel Plants" (Page 156), and "The Change in Steel Mill Products" (Page 172). I would like 30 reprints of each of these three articles.

Bayard Allis
Barium Steel Corp.
New York

Impressed with Coverage



I wish to request 12 copies of your article, "To Boost Productivity, Consult Your Employees" (Sept. 29, Page 65). I was impressed with the clarity and coverage of the subject in such a short article.

I am the industrial engineer here and at present am instructing a class of shop supervisors in the principles of process analysis and work simplification. The copies of this article will aid in illustrating the widespread use of these principles.

Willard L. Kern
Industrial Engineer -
Marion Power Shovel Co.
Division of Universal Marion Corp.
Marion, Ohio

• • •

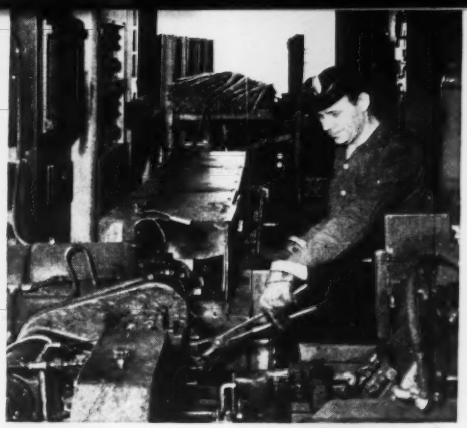
We quite thoroughly read and enjoyed this article and would appreciate three copies.

Frederick D. Evenson
Walenar Inc.
Holliston, Mass.

Harvard Studies STEEL Analysis

Last spring, we distributed copies of STEEL's 33rd Annual Financial Analysis of the Steel Industry (Mar. 31 insert)

(Please turn to Page 12)



At National Screw,
Youngstown Special Quality Hot-Rolled Bars are fed into this Hot Nut Former. Quality nuts are produced faster—with fewer rejects.

Accent on Excellence

Youngstown special quality hot-rolled bars

THE NATIONAL SCREW & MANUFACTURING CO.

Uniform high product quality is most important in nuts and bolts, too. If fastening assemblies fail, industrial and consumer products become worthless.

So Cleveland's National Screw & Manufacturing Company specifies Youngstown Special Quality Hot-Rolled Bars to maintain their product's quality at an unwaveringly high level. That's because they find Youngstown Bars are uniformly free of injurious seams, piping, laps and cracks—provide high output of defect-free products.

Wherever steel becomes a part of things *you* make, the high standards of Youngstown *quality*, the personal touch in Youngstown *service* will help you create products with an "accent on excellence".

THE
YOUNGSTOWN
SHEET AND TUBE COMPANY

Manufacturers of Carbon, Alloy and Yoloy Steel, Youngstown, Ohio

Series 2

PLUS ITEMS
from your
Whitehead Metals
"Supermarkets"

PLASTIC PIPE

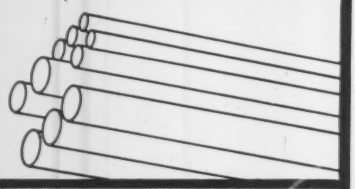
A full line of flexible and rigid plastic pipe and tubing in all commercial resins, in sizes from ⅛" to 4" OD. Fittings, cements and valves available from stock. Write for detailed literature.

NON-SKID ALUMINUM TREAD PLATE

Providing amazing gripping power (either oily or dry) this lightweight, corrosion resistant Alcoa product has a tough abrasive (fused aluminum oxide) rolled right into an aluminum base plate for longer wear. Available in four thicknesses —0.125", 0.188", 0.250" and 0.375" Write for descriptive booklet.

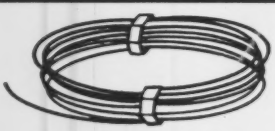
SHAFTING

Top quality shafting made of Monel, Tobin Bronze or Tempaloy. Originally developed for boats and other marine use, these shafts have gained wide industrial use in pumps and other machinery operating in corrosive atmospheres. Literature available.



WELDING FITTINGS

Stainless Steel forged welding fittings are stocked in I.P.S. sizes from ½" to 12" for Schedule 5S, 10S, 40S and 80S Pipe. All conventional shapes are on hand. Welding fittings are also stocked in Aluminum, Monel, Nickel and Inconel. Literature available.



DISSIMILAR METALS WELDING WIRE

A new item introduced at the 1958 Welding Show, Inco-Weld "A" Wire is a single product for inert gas welding of most combinations of dissimilar alloys. Technical Service and complete literature on request.

These "Plus Items" and many more are available in addition to a wide selection of corrosion-resistant sheet, rod and tube.

All told, there are more than 20,000 items distributed and serviced by Whitehead. All are available, off-the-shelf, from the nine Whitehead Metal "Supermarkets." All are the products of such leading producers as Alcoa, Anaconda, Inco & Crucible Steel to name just a few.

When you call Whitehead you get fast service, and frank, unbiased help in selection. Technical service when you need it. Add it up and you'll find it pays to

Call
WHITEHEAD
METAL PRODUCTS COMPANY, INC.
First!

303 West 10th Street • N. Y. 14, N. Y.

Other Offices and Warehouses:
PHILADELPHIA • BUFFALO
HARRISON, N. J. • CAMBRIDGE, MASS. • SYRACUSE • BALTIMORE
ROCHESTER • WINDSOR, CONN.

LETTERS

(Concluded from Page 10)

to students in the advanced production problems course here.

Because this analysis proved of great value, we would like to repeat this practice in November. Please send 65 copies of the 1958 Financial Analysis.

Richard S. Rosenbloom
Graduate School of Business Administration
George F. Baker Foundation
Harvard University
Boston

Reprints for Top Management

We would appreciate six copies of your Program for Management article, "Building Marketing Men" (Sept. 22, Page 69). This interesting article I would like to place in the hands of our top management.

C. R. Bangtson
Purchasing Agent
E. J. Longyear Co.
Minneapolis

• • •

We were much impressed with this excellent article and have need of ten reprints.

K. C. Woodrow
Manager
Metals Div.
Limbach Co.
Pittsburgh

Selection of Foremen

We would like 20 reprints of the article, "How To Pick and Train Foremen" (Sept. 1, Page 32). This article included "Twelve Commandments for a Good Foreman."

E. H. Mark
Works Manager
Arnot Furniture Div.
Aetna Steel Products Corp.
Jamestown, N. Y.

Program Scores Bull's-eye

Your Program for Management series is scoring a bull's-eye every time. Please send five reprints of articles No. 1 through No. 8 for our officers.

L. E. White
Industrial Engineer
Leggett & Platt Inc.
Carthage, Mo.

Wants More Reprints

I find the ten copies of the Program for Management articles you sent me extremely helpful and have been passing them out to the members of our junior board of directors.

Since I have been doing this, I find that some of our top management people have been interested in receiving them. I would appreciate receiving 13 instead of ten copies.

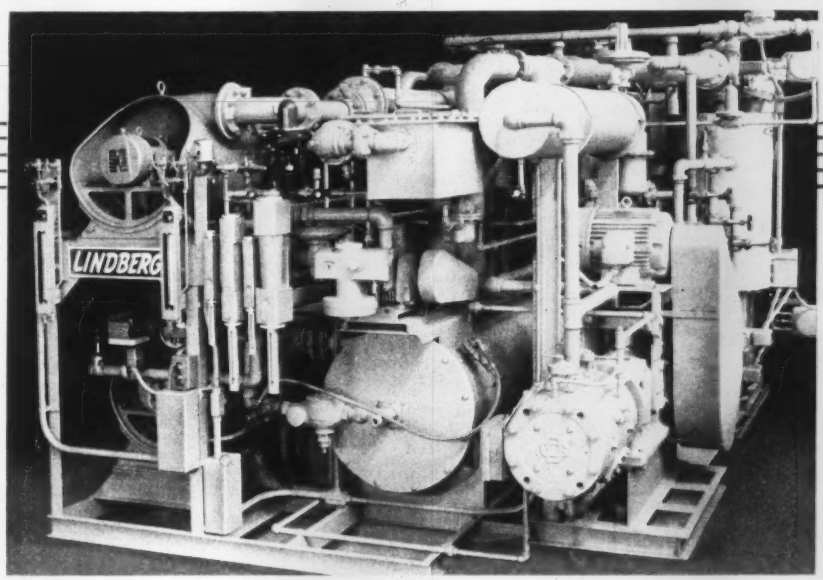
A. W. Sawyer
Assistant to the Vice President
Lincoln Electric Co.
Cleveland

*Atmosphere of 99.99% inert gases now provided by new Lindberg HYNI Generator

**Completely new, fully automatic, dry process provides highest degree of nitrogen purity

***This process produces nitrogen for only $0.17 to $0.20 per 1000 cubic feet

In the metals industry this superior nitrogen atmosphere is ideal for bright hardening, free from carburization and decarburization . . . annealing and normalizing without scale, decarburization or carburization . . . bright copper and silver brazing . . . carbon correction of decarburized forgings or bar stock . . . sintering of powder metals . . . gas carburizing and carbonitriding. It is also useful as a blanketing gas in the chemical and food processing industries.



This new HYNI generator is an important addition to Lindberg's complete line of controlled atmosphere generators. Write us for complete information on this remarkable new unit, and other Lindberg generators for any required atmosphere type.

See us, too, in Booth 331 at The Metal Show

** How The Process Operates

This 99.99% pure atmosphere is produced by a completely new, dry, fully automatic process. It uses the principle of burning a hydrocarbon fuel in a separate catalytic combustion chamber to obtain complete reaction without unburned methane, high residual oxygen or a high percentage of oxides of nitrogen. Carbon dioxide, water vapor, sulphur dioxide or hydrogen sulphide are simultaneously removed in a dry, absorbent material known as Molecular Sieve made by Linde Division of Union Carbide and Chemical Corporation.

* Sample of Analysis Obtainable With HYNI Generator

Oxygen	0.00%
Carbon dioxide	0.01%
Hydrocarbons	0.00%
Water vapor: Less than -80° F. dewpoint (7 p.p.m. when measured by a Beckman Hygrometer)	
Hydrogen	0.00%
Carbon monoxide	0.00%
Sulphur	0.00%
Oxides of nitrogen	0.00%
Nitrogen and Argon (trace)	99.99%

***This Process is Economical

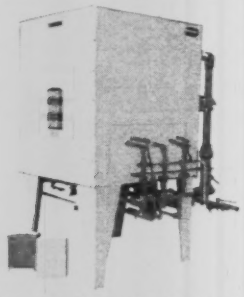
One of the advantages of this process of producing nitrogen is its low cost. With the HYNI Generator the nearly-pure nitrogen is produced for only $0.17 to $0.20 per 1000 cubic feet. Cost of power, raw gas and cooling water is included and based on: fuel gas at $0.60 per 1,000,000 BTU; electricity at $0.01 per KWH; cooling water at $0.05 per 1000 gal. Quoted cost does not include maintenance or amortization. Lindberg quality design and construction assures complete dependability and lowest maintenance cost.

LINDBERG

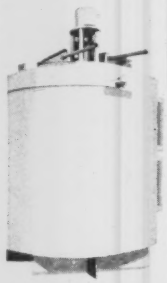
GAS PROCESSING DIVISION
ENGINEERING COMPANY 2441 West Hubbard Street, Chicago 12, Illinois

Wherever industry needs heat...

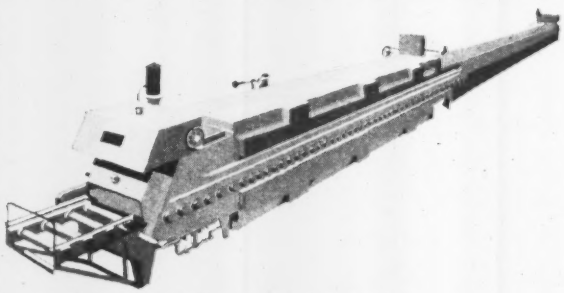
You'll find LINDBERG equipment just right for the specific job



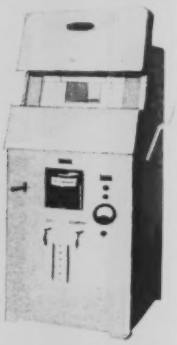
Ceramic Kilns: Gas-fired periodic kiln (shown) with temperature range to 3250° F.



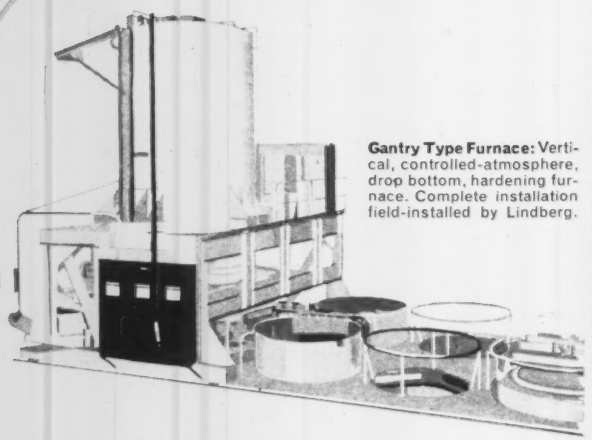
Vertical Type Furnaces: Carburizing and hardening furnace (shown) with CORRTHERM electrical heating elements.



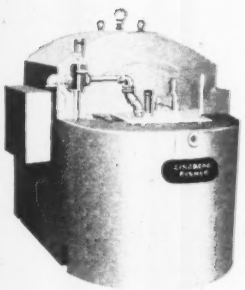
Roller Hearth Furnaces: Continuous electric type (shown) with temperature range 1300° to 2100° F.



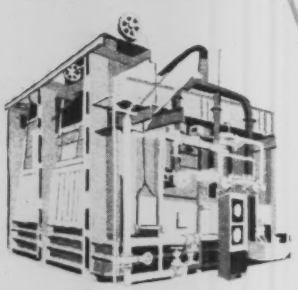
Laboratory Equipment: One-unit box furnace (shown), muffle or for non-oxidizing atmosphere with temperature range to 3000° F.



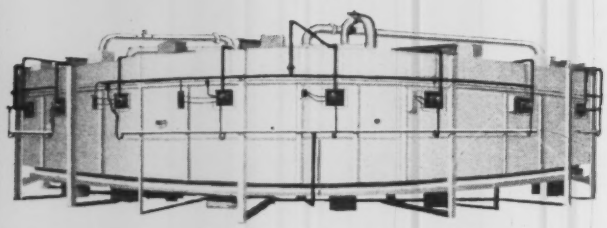
Gantry Type Furnace: Vertical, controlled-atmosphere, drop bottom, hardening furnace. Complete installation field-installed by Lindberg.



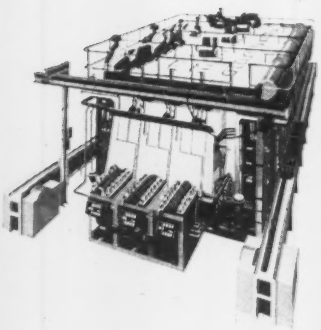
Melting and Holding Furnaces: Electric resistance furnace (shown) with capacities of 750 lbs. to 1500 lbs.



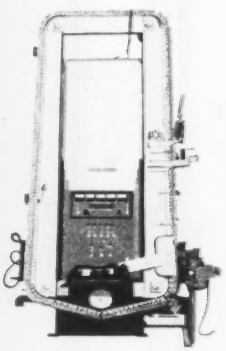
Aluminum Reverberatory Furnaces: Twin-chamber melting and holding furnace (shown) with 45,000 lbs. capacity.



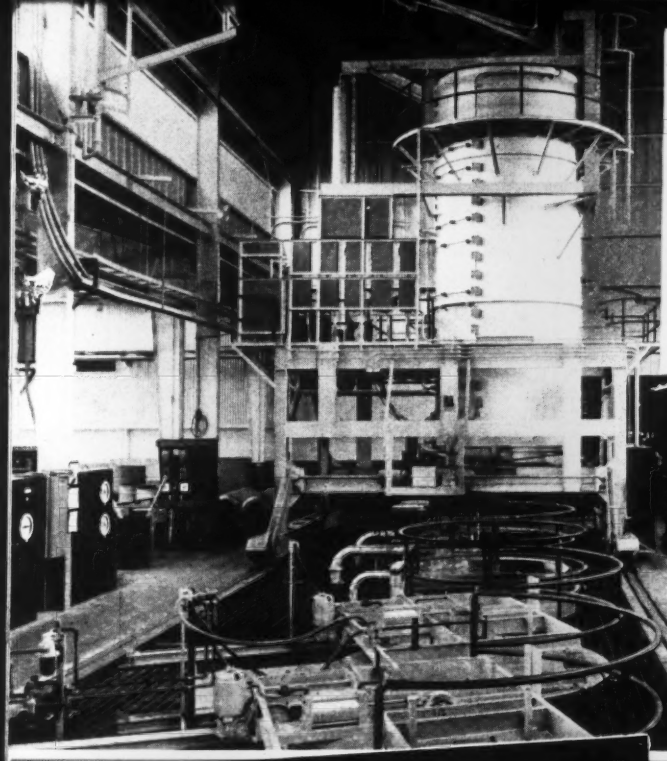
Rotary Hearth Furnaces: Doughnut type field-installed gas-fired furnace (shown) with capacity of 13,000 lbs. per hour.



Multiple Row Pusher Furnaces: Three-row, vertical radiant tube pusher carburizing furnace (Shown). Capacity, 650 lbs. per hour to case depth of 0.055".



High Frequency Units: Vertically designed, completely automatic "HF" unit (Shown) for aluminizing automotive valves.



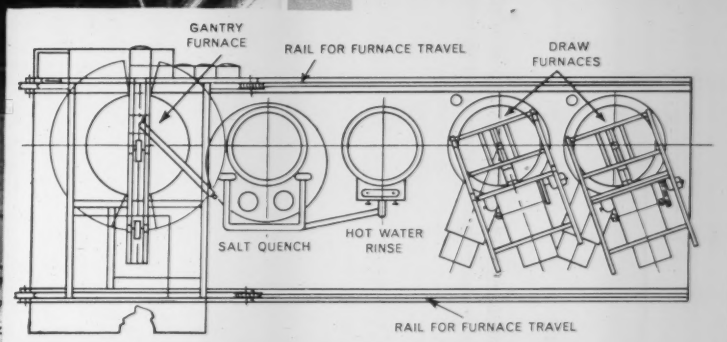
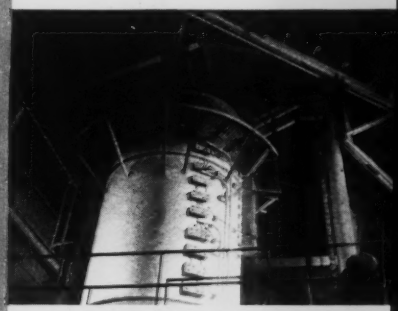


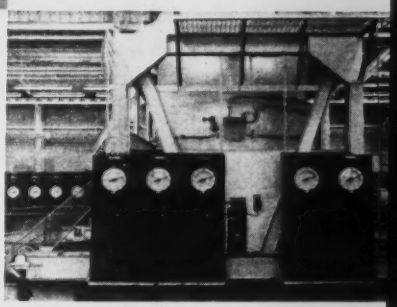
Diagram shows efficient grouping of all elements of the installation.



Furnace is more than 24 feet high. Chain shown at right lifts work into furnace.

Lindberg-Designed

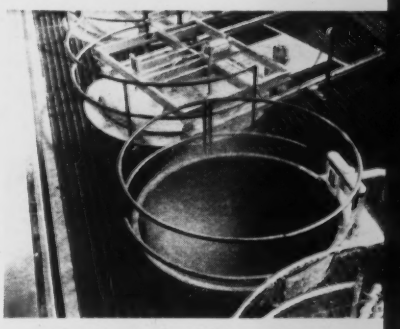
The World's Largest Vertical Controlled-Atmosphere Drop Bottom Hardening Furnace



Lindberg control panels are conveniently located adjacent to the installation.

This remarkable furnace combination was recently installed by Lindberg Industrial Corporation for a prominent missile manufacturer. It was designed by Lindberg engineers, in cooperation with the engineering staff of the manufacturer. The furnace is more than 24 feet high and is capable of heat treating rocket cases more than 5 feet in diameter and 20 feet long. The installation consists of the electric, controlled-atmosphere, Gantry type furnace and two draw furnaces, a hot water wash tank, a salt bath quench and a high nitrogen generator. The Gantry type furnace moves under power over the entire installation to load or unload at any of the pit stations. With this installation, production has been economized and speeded, and the metallurgical qualities of rocket cases improved.

Lindberg equipment and Lindberg planning can help you find the most effective answer to any problem of applying heat to industry. We cover the field, heat treating, melting and holding, tempering, brazing, enameling furnaces, ceramic kilns, high frequency units, and are in the ideal position to recommend just the type of equipment most suitable for your needs. This can be factory built or field-installed in your own plant, fuel-fired or electric. Consult your local Lindberg Field Representative (see the classified phone book) or get in touch with us direct. Lindberg Industrial Corporation, 2321 West Hubbard Street, Chicago 12, Illinois. Los Angeles Plant: 11937 South Regentview Avenue, at Downey, California.



Pit has depth of more than 20 feet to accommodate large rocket cases.

★ **Look up Lindberg . . . Booth 331 at the Metal Show**

LINDBERG heat for industry

if you buy
stampings
...look for the
PLUS
beyond
the PRICE!...

immediate availability of material
for instance

On hand always *in our plant* is an extensive inventory of a wide variety of materials*, available normally only on special order from mills.

No need for our customers to wait for such materials!

For your next hurry-up stampings . . . look for this plus beyond the price . . . *immediate availability of material* . . . and let us quote before you buy!

A brochure is yours for the asking!

DE-STA-CO

DETROIT STAMPING COMPANY

Established 1915

359 Midland Ave., Detroit 3, Mich.

"America's Leading Job Stamping Manufacturer"

***Our stock of materials includes—close-tolerance spring steel, both tempered and annealed; copper and copper-base alloys, various analysis of carbon steels, and imported Swedish Flapper-Valve steel.**

Look to Detroit!

. . . and remember, STAMPING is our middle name

STEEL
The Metalworking Weekly

Editor-in-Chief, IRWIN H. SUCH

Editor, WALTER J. CAMPBELL

Associate Managing Editors, VANCE BELL, JOHN S. MORGAN

WILLIAM M. ROONEY .....Market Editor
ROBERT F. HUBER .....Machine Tool Editor
HARRY CHANDLER .....Copy Editor
GLENN W. DIETRICH....Associate Copy Editor
FRANK R. BRIGGS .....Associate Editor
ROBERT O. JAYNES .....Associate Editor
ROBERT M. LOVE .....Associate Editor
AUSTIN E. BRANT .....Associate Editor
ROSS WHITEHEAD .....Associate Editor
GEORGE J. HOWICK .....Assistant Editor
G. MacF. TUTTLE .....Assistant Editor
THOMAS H. SMITH .....Assistant Editor
DERRY EYNON .....Assistant Editor
NEAL ROBERTS .....Assistant Editor
MARY T. BORGERHOFF .....Assistant Editor
MARY ALICE EARLY .....Assistant Editor
EILEEN CORTES .....Assistant Editor
MARY ANN STUVE .....Editorial Assistant
JANE WEDGE .....Editorial Assistant

THOMAS H. BRYAN, TOM WELSH, Art Editors

IRENE KASNER, Editorial Service

Resident Editors

New York 17 .....60 E. 42nd St.
B. K. PRICE, L. E. BROWNE
BRIAN WILSON, H. GLENN CANARY
Murray Hill 2-2581

Chicago 11 .....520 N. Michigan Ave.
ERLE F. ROSS, WILLIAM E. DEAN
Whitehall 4-1234

Pittsburgh 19 .....2837 Koppers Bldg.
WILLIAM V. WALLACE—Atlantic 1-3211

Detroit 35 .....15800 W. McNichols Rd.
A. DONALD POSTMA—Broadway 3-8150

Washington 4 ....1123 National Press Bldg.
JOHN R. BOTZUM—Executive 3-6849

Editorial Correspondents

Birmingham—Birmingham 3-1121 R. W. KINCEY
Buffalo—Emerson 5385 ....GEORGE E. TOLES
Youngstown—Riverside 7-1471..GEO. R. REISS
Los Angeles—Webster 5-1234..NORMAN LYNN
San Francisco—Yukon 6-5151 EDWIN HAVERTY
Seattle—Melrose 2-1895 .....R. C. HILL
Cincinnati—Beechmont 1-9607...DICK HAVLIN
Toronto, Canada—Empire 4-9655..F. S. TOBIN
Birmingham, England .....J. A. HORTON
Paris, France .....LEON JAUDOIN-PROM
Brussels, Belgium .....PAUL DE KEYSER
Dusseldorf, Germany ....DR. HERBERT GROSS
St. Louis—Garfield 1-1212, HAMILTON THORNTON

BUSINESS STAFF

Business Manager, D. C. KIEFER

Asst. Business Mgr.....C. A. TALLINGER JR.
Advertising Service Mgr. ...DORIS MITCHELL
Production Manager .....A. V. ANDERSON
Classified Advertising .....EVELYN DIETZ
Promotion Director .....S. F. MARINO
Market Research Mgr. ....T. M. BALLANTINE
Circulation Director .....J. C. GERNHARD
Distribution Manager .....G. R. EBERSOLE

Reprints, JUNE SCHILENS

Advertising Representatives

New York 17 .....60 E. 42nd St.
K. A. ZOLLNER, GUY LABAW
Murray Hill 2-2581

Wynnewood, Pa. (Phila.) 200 Wynnewood Ave.
WM. J. VERSCHOOR—Midway 2-6512

Farmington, Conn. .....12 Farmstead Lane
CALVIN FISHER JR.
Orchard 7-1756

E. Rochester, N. Y. .....217 Ridgeview Dr.
HAROLD A. DENNIS—Browning 2105

Pittsburgh 19 .....2837 Koppers Bldg.
J. C. SULLIVAN—Atlantic 1-3211

Cleveland 13 .....Penton Bldg.
J. K. GILLAM, N. W. MANNING—Main 1-8260

Cincinnati 6 .....2215 Victory Parkway
E. L. FRANKE—Parkway 1-0711

Detroit 35 .....15800 W. McNichols Rd.
C. A. TALLINGER JR., D. C. HYDE
Broadway 3-8150

Chicago 11 .....520 N. Michigan Ave.
L. C. PELOTT, W. L. POLAND
WM. J. D'ALEXANDER, RICHARD BIRDSONG
Whitehall 4-1234

Los Angeles 36 .....5943 W. Colgate Ave.
F. J. FULLER—Webster 1-6865

San Francisco 4 .....57 Post St.
Robert W. Walker Co.—Sutter 1-5568

Griffin, Ga. .....1106 Pine Valley Rd.
FRED J. ALLEN—Griffin 7854

Clearwater, Fla. .....1954 Jeffords Dr.
H. G. ROWLAND

Dallas 35 .....818 Exchange Bank Bldg.
JAMES H. CASH—Fleetwood 1-4523

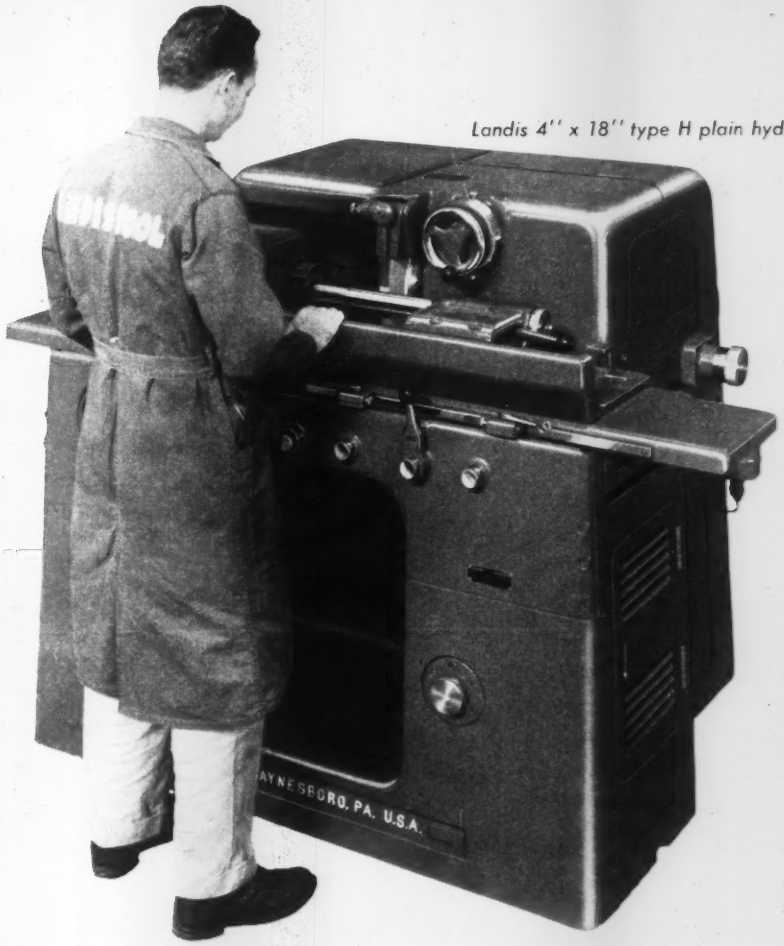
BPA

NBP

Published Every Monday by
THE PENTON PUBLISHING CO., Penton Bldg., Cleveland 13, Ohio
MAin 1-8260

GEORGE O. HAYS .....Chairman
RUSSELL C. JAENKE .....President
FRANK G. STEINEBACH .....Vice President and Secretary
FRANK O. RICE .....Vice President
JOSEPH P. LIPKA .....Treasurer and Assistant Secretary

Also Publisher of
FOUNDRY, MACHINE DESIGN, NEW EQUIPMENT DIGEST, AUTOMATION
Member of Business Publications Audit of Circulation Inc., Society of Business Magazine Editors, and National Business Publications Inc.

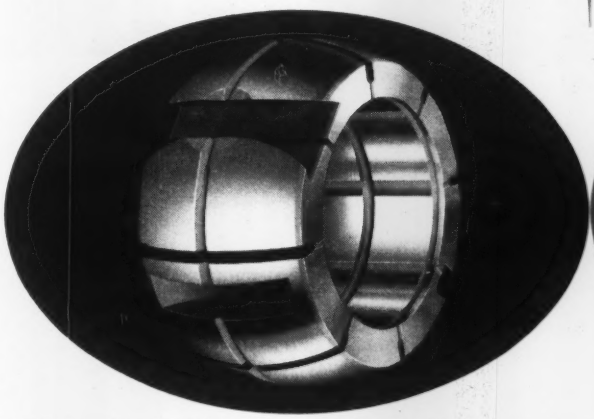


Landis 4" x 18" type H plain hydraulic grinder

Production and precision of 4" Landis hydraulic grinder give lower cost per unit

condensed specifications

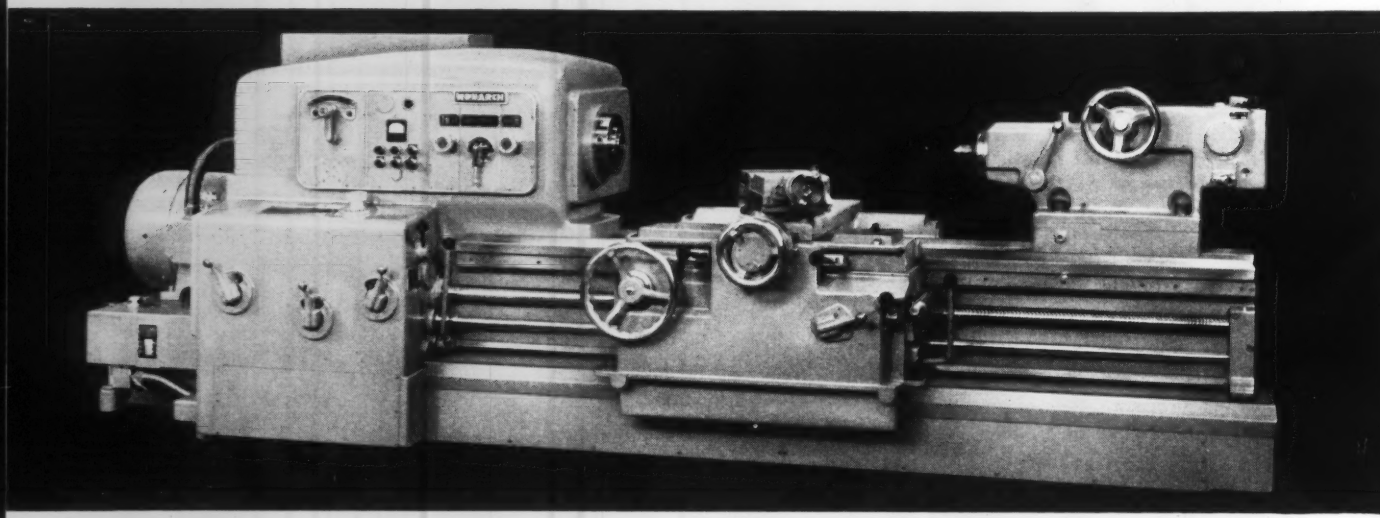
Nominal work swing	4"
Length between centers	18"
Diameter grinding wheel	16"
Wheel drive motor	3 hp.
Work speed range (rpm)	200-900
Net weight	4400 lbs.



Exclusive Landis Microsphere wheel spindle bearings . . . with closest running clearance of any spindle bearings, for added precision and shorter spark-out time.

LANDIS
precision grinders
LANDIS TOOL COMPANY / WAYNESBORO, PENNA.

BIG-BY 2 YARDSTICKS!



Heavy duty lathes are intended primarily for heavy stock removal from large work having considerable weight. But more than massive machine components and swing capacity are required. The basic consideration is almost always greater production, therefore lowered costs.

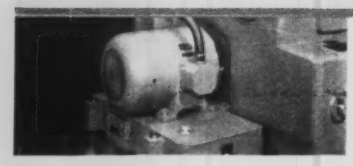
This you get in the Monarch Series 80 Heavy Duty Dyna-Shift—an ultra-modern machine which will remove more metal at any speed than is possible on any other heavy duty lathes. Maximum production results because the machine can be kept under full load during the entire cutting cycle. Major contributing factors are more machine output per unit of power input, less operator effort, reduced maintenance and ease of supervision.

Performance reports from the field reveal production increases of 25% or more along with a like improvement in tool life. As always, invest in the best—the cheapest in the long run. The Series 80 includes two separate machines—two models for work requiring 25″-30″ clearance diameter, 16″-20″ swing over cross slide and three models for larger and heavier work in the range of 32″-40″ clearance diameter and 20″-28″ swing over cross slide.

These machines are big in size and even bigger in productivity—Ask for Booklet 1603.

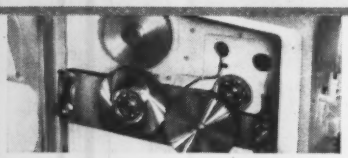
THE MONARCH MACHINE TOOL COMPANY, SIDNEY, OHIO

PRODUCTIVITY



ELECTRICALS RIGHT WHERE THEY BELONG

1. External main drive motor mounting and external electrical control mounting (either NEMA or JIC) for quick accessibility.
2. Motor mounted on hydraulic system sump also supplies power for hydraulic pump.



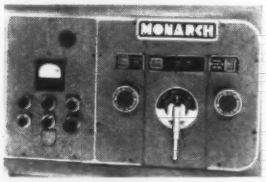
PROTECTED GEAR BOX AND END GEARING

1. Both the gear box and end gearing are totally enclosed. Lubrication is kept in, dirt kept out, original accuracy maintained.

SPECIAL INTERLOCKS—SAFETY FIRST

1. When machine is started, the brake engages automatically, preventing spindle rotation regardless of main control lever position.
2. No speed shift can be made with spindle rotating. More than anything else this preserves the original accuracy of headstock gearing.
3. Leadscrew and feed rod cannot be engaged simultaneously; neither can feed and power rapid traverse.

WEIGHT



THE HEADSTOCK THAT THINKS

1. 36 speeds—range 10 to 1250 R.P.M. on some models, 8 to 1000 R.P.M. on other models—ratio 1 to 125. Standard range low enough, high enough, with plenty of speeds in between to provide reasonably constant surface cutting speed on most work.
2. Operator works in terms of surface cutting speed. Machine automatically figures correct R.P.M. and sets up shift. Operator sets two dials—one for work diameter, the other for desired surface speed. A speed indicator always shows the R.P.M. in engagement.
3. Flip of a lever gives free spindle in a jiffy. And there is a generous 3-1/16″ or 3-9/16″ hole through the spindle.
4. Hydraulic brake and clutch are self-adjusting for wear. Being under automatic machine control regardless of load, operator needs not supply power for engagement.

APRON—THE CONTROL CENTER OPERATORS GO FOR

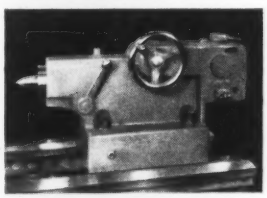
1. Provided with four-way, hydraulic, variable speed power rapid traverse. Both carriage and cross slide traverse may be engaged simultaneously. Infinitely variable speed feature permits such extremely close control that manual handwheel traverse is virtually eliminated.
2. Apron and cross feed handwheels automatically disengage during traverse as a safety feature. A single jaw clutch in each mechanism causes feed pick-up at the same point after any traverse movement.
3. Positive, cam controlled feed frictions. Application is such that machine never loses its chip under the heaviest of cuts.
4. All controls located to permit operation from a stand-up position—no stooping or stretching necessary.

THE BED—SOLID AS GIBRALTER

1. All four bed ways flame hardened and precision ground to keep them factory-fresh for years to come.
2. Triangular bridge type girth construction provides stability needed for heavy duty work. Center section of bed designed in such a manner that chips automatically flow through openings in the rear to chip pan for extra-easy removal.
3. With chip pan set to rear and low work center height, operator can get conveniently near the spindle to change centers, chucks, work pieces and so forth.
4. Longer machines equipped with traveling rod supports which are automatically picked up and dropped off by apron.

EXTRA EQUIPMENT—EXTRA PRODUCTION

1. Additional equipment in considerable variety is available for the Series 80 line. Consider, by all means, the advantages of the "Air-Gage Tracer", a means by which thousands of users have reduced costs substantially.
2. Ask for descriptive Booklet 1603 which not only describes the basic machine but the commonly used items of additional equipment and includes full specifications.



THIS TAILSTOCK MEANS BUSINESS

1. Either single speed or two speed range type available with dead or anti-friction center spindle. Sufficient mass, rigidity and spindle size (5-3/4″ or 6-1/2″ diameter) to support the heaviest of cuts.
2. Work piece expansion, due to heat, absorbed by heavy duty springs in tailstock.
3. Handwheel located at front for operator convenience when changing work pieces.
4. Movement along bed manually or by power. This combination satisfies all turning conditions.

COMPLETE AUTOMATIC LUBRICATION

1. Headstock, end gearing and gear box served by single system of the filtered, combination mist-splash type.
2. Apron lubrication system of the circuited, metered and filtered type also provides oil to carriage guide ways and cross slide bearings. There is ample lubrication during both power and manual longitudinal and cross feed.
3. Tailstock has its own lubrication system.

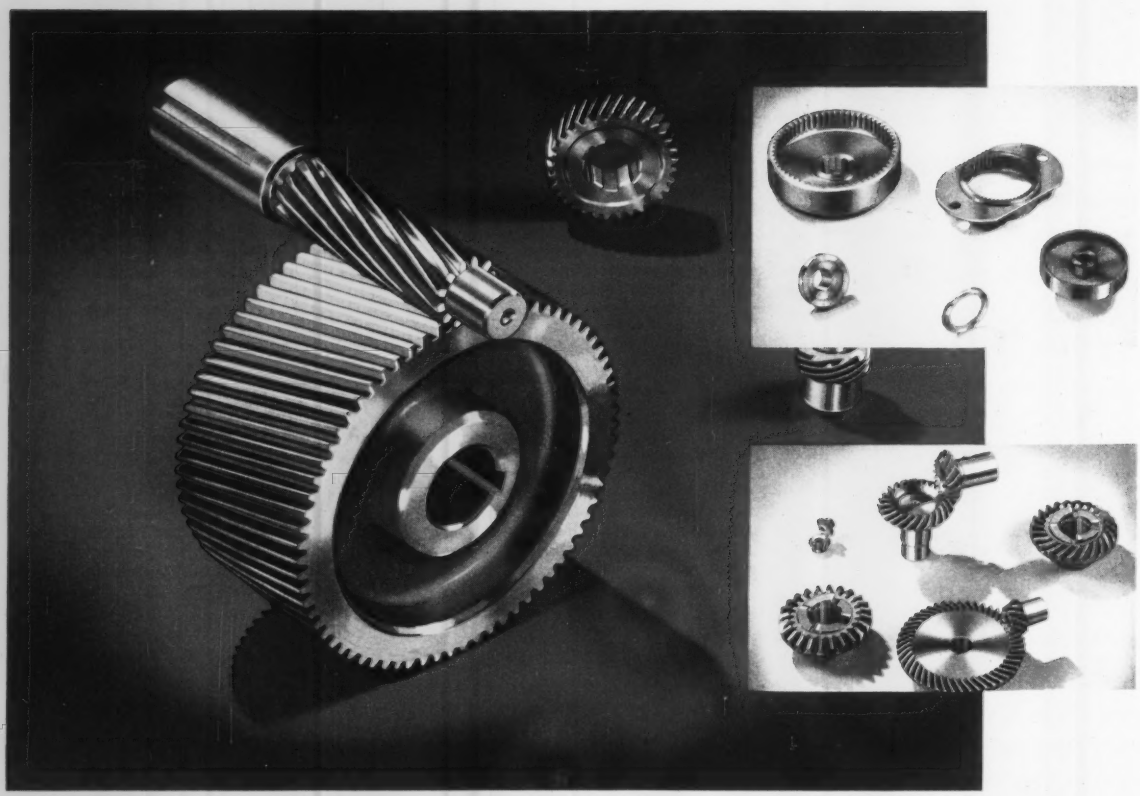
MACHINE CONTROL—THE EASY WAY

1. Series 80 controlled by a three-position lever at the apron. A duplicate lever close to the headstock is provided for setup purposes. With this lever, work rotation may be started or stopped and jogging may be accomplished.
2. Shifting, an operation performed many times each day, is at fingertouch ease and speed. Hydraulic power does the work of clutching, braking, gear shifting and jogging.

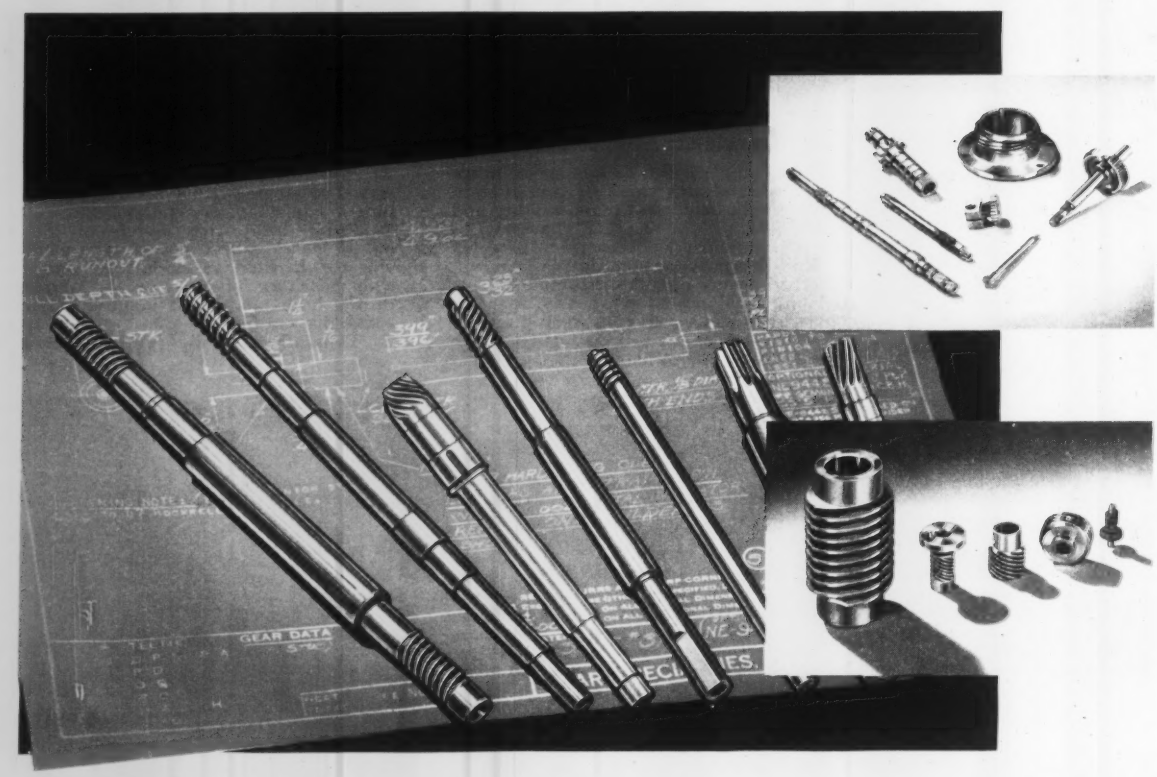
SUPERVISION IN A JIFFY

1. At a quick glance, supervisor may check (a) work diameter setting, (b) S.F.P.M. setting and (c) H.P. consumption. This makes it possible easily and quickly for him to assure full productiveness of the machine and the operator at all times.

Monarch
ACCURACY • ECONOMY • LONG LIFE
TURNING MACHINES
FOR A GOOD TURN FASTER . . . TURN TO MONARCH



All types of Small Gearing—made with custom



SPECIALLY ENGINEERED OR STANDARD GEARS—YOUR NO. 1 SOURCE IS G.S.

Have you an especially difficult, especially complex, especially critical power transmission link in your production chain, involving Fine or Intermediate Pitch Gearing? Have you been penalizing yourself with short-run production—at short-run high cost—to assure yourself of the custom precision you require? Then G.S. has a great deal to offer you.

G.S. takes great pride in the long, long list of customers who have relied on our ability and our performance for many years to supply all or the major part of their Small and Intermediate Gearing requirements. The most famous leaders in a dozen major industries are old friends—along with hundreds of smaller but mighty important producers of quality units.

A supplier has to do more than just "make gears" to develop and maintain such a business. For one thing, he must develop a staff of outstanding experts in all the phases of design and manufacture of his specialty; for another, he must maintain a sincere interest in the solution of the problems of his customers, large or small—not just a yen for another order; and third, he must be able to consistently deliver custom quality under the most demanding conditions—*at full-run production prices.*

Now well into our fifth decade of specialization, G.S. is *the world's largest exclusive manufacturer of fractional horsepower gearing*—with the most modern, most complete, most efficient manufacturing equipment and production techniques you can find, to implement our mounting years of practical experience.

We invite your inquiry about what G.S. might do for you—in terms of potential savings, improved product performance and useful life, fewer costly interruptions to your production lines because of over-variance from specifications. Our engineers are at your service to discuss development of new projects, or better means of accomplishing old ones. Call or write us today.

precision in production quantities...

YOU'LL FIND G.S. GEARING IN TOP QUALITY PRODUCTS LIKE THESE . . .

Adding Machines • Aircraft Carburetors & Fuel Metering Systems • Aircraft Instruments and Radios • Automatic Musical Instruments • Automation Systems • Business Machines • Check Signing & Protecting Machines • Clippers for Barbers, Animal Shearing & Hedge Trimming • Cloth Cutting Machines • Coin Changers & Counters • Communication Equipment • Control Mechanisms • Electric Fans • Electric Motors • Floor Polishers, Sanders, Scrubbers, Sweepers • Food & Drink Mixers, Blenders • Home Appliances • Lawn Sprinklers • Machine Tools • Meat Tenderizers, Grinders, Slicers • Military Equipment • Motion Picture Cameras & Projectors • Optical Instruments • Outboard Motors • Pneumatic Production Tools • Radio & Radar Tuning Assemblies • Radio Anti-backlash Gears • Range Finders • Record Changers • Sewing Machines • Steel Strap Stretchers • Step Switches • Tapping, Drilling & Threading Equipment • Telephone Dials • Television Sets • Thermostatic Controls • Typewriters • Vending Machines • Washing Machines.

•

SEND FOR G.S. *illustrated folder! See where and how we mass-manufacture Small Gearing to uniformly fine tolerances. Folder contains 23 pictures of Small Gears, plant view, as well as Diametral and Circular Pitch Tables. Ask for your copy on company stationery, please!*

FRACTIONAL HORSEPOWER GEARING

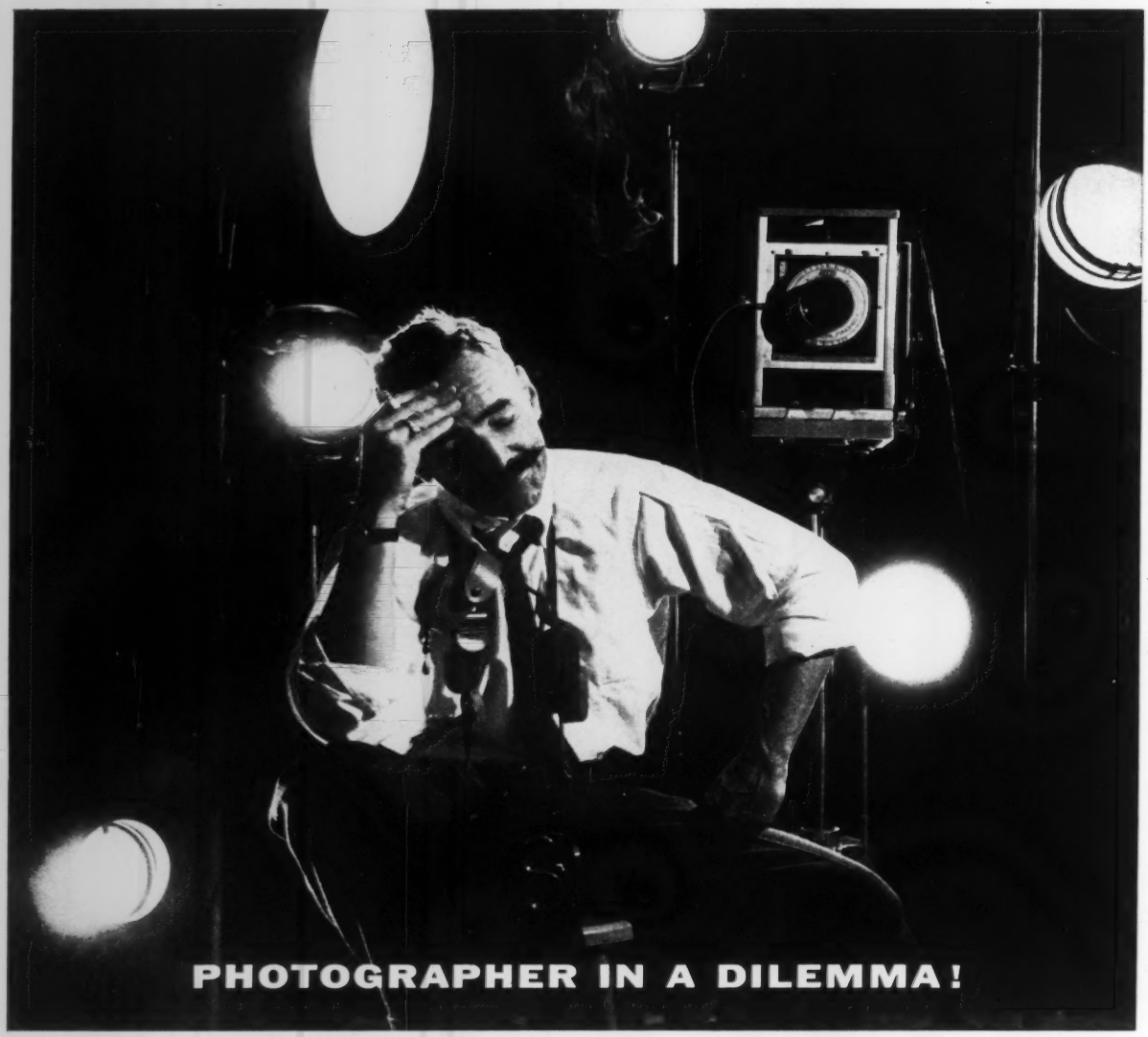
GEAR Specialties, Inc.

2635 WEST MEDILL AVENUE
CHICAGO 47, ILLINOIS

SPURS • SPIRALS • HELICALS • BEVELS • INTERNALS
WORM GEARING • RACKS • THREAD GRINDING

WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF FRACTIONAL HORSEPOWER GEARING

42 Years of Specializing in Small Gearing!



He can't figure out how to photograph all 12,000 sizes of FEDERAL BALL BEARINGS

If 12,000 seems to you like a lot of ball bearing sizes for a single plant to produce—you're right.

There are hundreds of different types, too. And as you might expect, the end applications of this unusual variety of bearings are almost limitless. For instance, you'll find Federal Ball Bearings in IBM Calculators . . . Skil Saws . . . Ford Cars . . . Westinghouse Motors . . . Conomatic Machine Tools. Names you know and trust have put *their* trust in Federal Ball Bearings.

That's why we say: when Federal Ball Bearings are part of so many things you *use*, shouldn't they be part of the things you *make?*

THE FEDERAL BEARINGS CO., INC. • POUGHKEEPSIE, NEW YORK

Federal **Ball Bearings** *One of America's Largest Ball Bearing Manufacturers*

CALENDAR
OF MEETINGS

Oct. 20-22, Society of Automotive Engineers: Transportation meeting, Lord Baltimore Hotel, Baltimore. Society's address: 485 Lexington Ave., New York 17, N. Y. Secretary: John A. C. Warner.

Oct. 21-23, Rail Steel Bar Association: Fall meeting, Sheraton-Blackstone Hotel, Chicago. Association's address: 38 S. Dearborn St., Chicago 3, Ill. Secretary: W. H. Jacobs.

Oct. 23-25, American Institute of Mining, Metallurgical & Petroleum Engineers Inc.: Mid-America minerals conference, Chase, Park-Plaza Hotels, St. Louis. Institute's address: 29 W. 39th St., New York 18, N. Y. Secretary: E. O. Kirkendall.

Oct. 23-25, National Management Association: Annual meeting, Statler Hotel, Los Angeles. Association's address: 321 W. First St., Dayton 2, Ohio. Executive vice president: Marion Kershner.

Oct. 26-30, American Institute of Steel Construction: Annual meeting, Greenbrier, White Sulphur Springs, W. Va. Institute's address: 101 Park Ave., New York 17, N. Y. Executive vice president: L. Abbett Post.

Oct. 27-29, American Gear Manufacturers Association: Semiannual meeting, Edgewater Beach Hotel, Chicago. Association's address: 1 Thomas Circle, Washington 5, D. C. Executive director: J. C. Sears.

Oct. 27-29, National Lubricating Grease Institute: Annual meeting, Edgewater Beach Hotel, Chicago. Institute's address: 4638 J. C. Nichols Parkway, Kansas City 12, Mo. Executive secretary: T. W. H. Miller.

Oct. 27-31, American Institute of Electrical Engineers: Fall general meeting, Pittsburgh. Institute's address: 33 W. 39th St., New York 18, N. Y. Secretary: N. S. Hibshman.

Oct. 27-31, Metallurgical Society of AIME: Institute of Metals Division's fall meeting, Carter Hotel, Cleveland. Society's address: 29 W. 39th St., New York 18, N. Y. Secretary: Ernest Kirkendall.

Oct. 27-31, National Metal Congress & Exposition: Public Auditorium, Cleveland. Sponsor: American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

Oct. 27-31, American Society for Metals: Annual meeting, Statler Hotel, Cleveland. Society's address: 7301 Euclid Ave., Cleveland 3, Ohio.

Oct. 28, Ultrasonic Manufacturers Association: Annual meeting, Hotel Cleveland, Cleveland. Association's address: 271 North Ave., New Rochelle, N. Y. Executive secretary: C. E. Herington.

APEX -authority on fastening

FOR SPECIAL NUT RUNNING APPLICATIONS

Routine equipment maintenance in a midwestern factory requires frequent removal and replacement of castellated nuts of various sizes. Standard sockets can't be used for this work, as each nut fits snugly into a deep, narrow recess.

This job used to be done, after a fashion, with a hammer and chisel. Now, Apex special sockets, specifically designed and built for this application, are used. The Apex method is faster, safer and cheaper . . . and it eliminates costly damage to tools and fasteners.

Almost everyone knows that, at Apex, "we quote promptly on specials" . . . and we produce and deliver just as promptly. On your special fastening problem, why not ask Apex for the answer?

FOR STANDARD NUT RUNNING APPLICATIONS

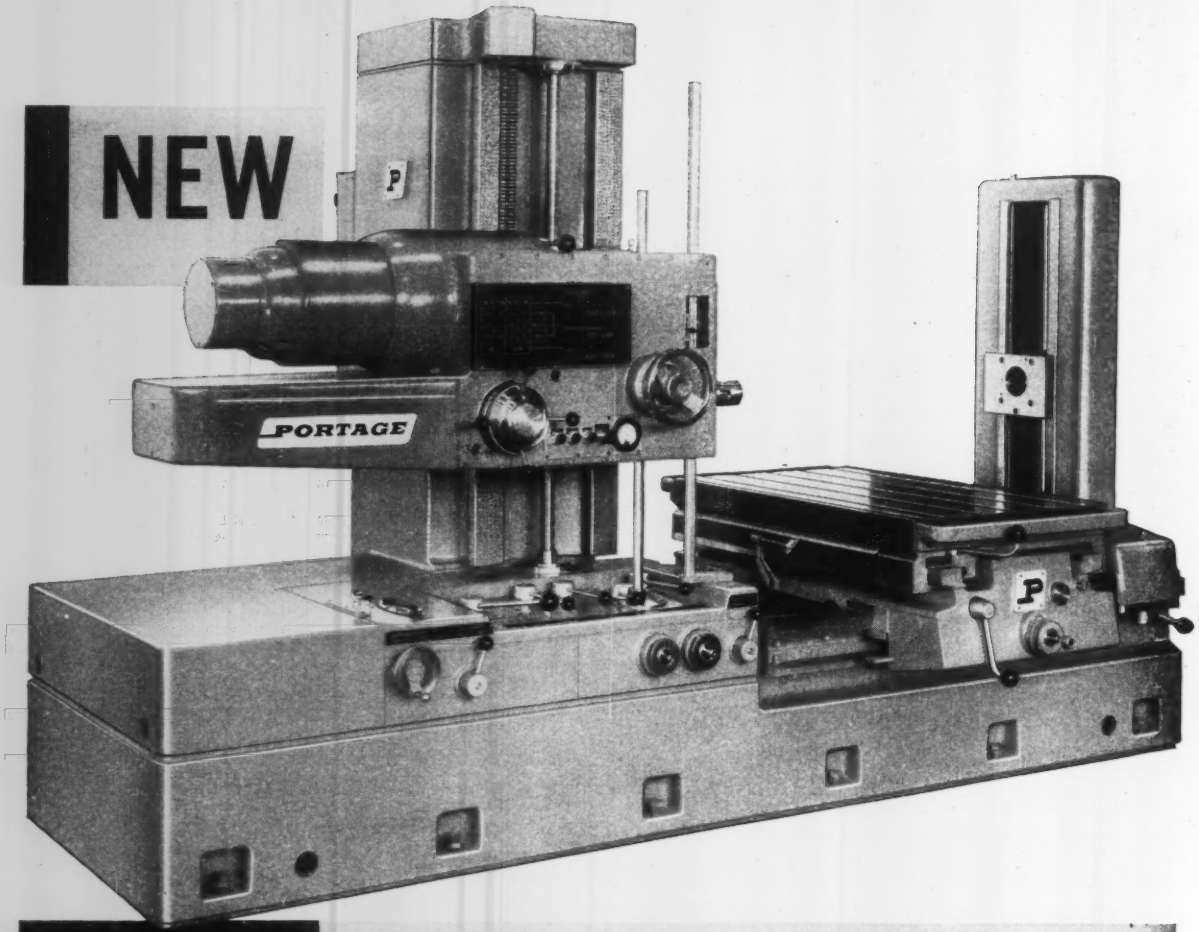
Apex has the specials . . . plus more than 5,000 stock sizes and types of nut running tools as well. Wherever there's a nut running job, Apex Catalog 29-R is needed. Write, on your company letterhead please, for your copy.

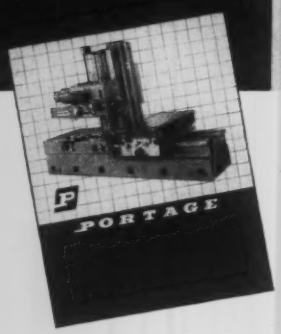
1933 *A Quarter Century of Service to Industry* 1958

THE APEX MACHINE & TOOL CO.
1032 S. Patterson Blvd.
DAYTON 1, OHIO

TOOLS FOR screwdriving nut running FASTENING

NEW





Literature, just off the press, covers features and specifications.

PORTAGE...3" diameter horizontal milling, drilling and boring machine

Mr. Buyer... here's a 3 inch bar machine you can't afford not to investigate. It's new from the top of the column to the bottom of the base... All new speeds and feeds, plus a versatility of job applications make it a real money maker. All new construction features offer a truly strong, rugged machine... and the pay-off... it's priced amazingly low, every shop can afford one ...write, wire or phone for complete information.

THE PORTAGE MACHINE COMPANY

1049 SWEITZER AVE., AKRON 11, OHIO
PORTAGE 2-0211 TWX AK266

BUILDERS OF PRECISION MACHINE TOOLS, SPECIAL AND PRODUCTION MACHINERY SINCE 1916

USS "T-1" Steel can be flame cut, welded, formed, sheared, punched, machined or forged.

How to **beef-up** your equipment without adding fat

Build it stronger, tougher and lighter with USS "T-1" Steel. This remarkable steel was developed especially to meet the needs for bigger tools, stronger equipment, larger yet less massive structures.

USS "T-1" Steel is a low carbon, quenched and tempered constructional alloy steel combining weldability and formability with exceptional strength and toughness. Because of its high yield strength (100,000 psi minimum) you can cut weight safely—in actual applications, as much as 25% to 50% weight reductions have been achieved.

Total costs can frequently be reduced, too. In applications such as heavy machinery, rotating parts, pressure vessels and bridge members, steel costs can be lowered by reduction in cross section and substantial savings experienced in welding, maintenance, freight and erection costs.

Also, in equipment subjected to impact abrasion, USS "T-1" Steel pays off. Users report service life increases ranging from 25% to 100%—or more. Power shovel buckets, bulldozer blades, coal and ore bins . . . all cost less in the end when made of "T-1" Steel because they last longer, cost less to maintain.

Write for free book. The many advantages, applications and cost-saving features of this versatile steel are completely described in our book USS "T-1." United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

USS and "T-1" are registered trademarks

United States Steel Corporation – Pittsburgh
Columbia-Geneva Steel – San Francisco
Tennessee Coal & Iron – Fairfield, Alabama
United States Steel Supply – Steel Service Centers
United States Steel Export Company

USS **United States Steel**

Why cyclotron magnet frames are made from forgings

Man is in a desperate race to learn more about magnetics. One famous acres-big cyclotron could be reduced to the size of a steamer trunk if they could only find a way to increase the magnetic field strength by 20 times. And already we see evidence that very strong magnetic fields may hold the secret to one of man's most sought-after dreams: sustained nuclear fusion power generation.

But when you double the strength of a magnetic field, the energy density or pressure increases *fourfold*. A not-uncommon 50,000 gauss magnetic field exerts a pressure of about 1,400 psi; but other laboratory experiments have already created fields of 1½ million gauss for a few microseconds, and they confidently expect to hit *10 million* gauss before long!

To contain the fantastic forces, designers of very large electromagnets turn to high-quality forged steel parts, and they very often come to United States Steel to ask for USS Quality Forgings.

The picture shows a cyclotron electromagnet frame that will go into service at Oak Ridge National Laboratory, Oak Ridge, Tennessee. It is made from six USS Quality Forgings that total 193 tons including the two cylindrical pole pieces. The pole pieces are machined to a .005″ flatness, and are parallel to within .005″. These tolerances are essential for close control over the bombarding particle beam—which often operates at velocities which approach 50,000 miles *per second*. All six forgings were melted, forged, machined, heat-treated and inspected right at our Homestead Forgings Division, and we also furnished all dowels (4½″ in diameter), nuts, bolts and lifting eyes.

Many cyclotron and nuclear reactor parts are made from USS Quality Forgings because buyers have learned that they are made from the finest steel, on the most modern equipment, by the most skilled forging men in all the world. No matter what kind or size of USS Quality Forgings you buy, you get the advantage of these same facilities. Please address inquiries or requests for our free forgings booklet to United States Steel, 525 William Penn Place, Pittsburgh 30, Pa.

USS is a registered trademark

United States Steel Corporation – Pittsburgh
Columbia-Geneva Steel – San Francisco
Tennessee Coal & Iron – Fairfield, Alabama
United States Steel Export Company

USS United States Steel

4917-4

To date, monolithic flat arch cover (refractory concrete made with LUMNITE calcium-aluminate cement) has provided 4 years' maintenance-free service in pit-type gas annealing furnace. Service Foundry Division, Avondale Marine Ways, Inc., New Orleans.

"...installation time cut in half...no maintenance...less heat loss,"

says Carl W. Goodgion, Chief Metallurgist, Service Foundry Division, Avondale Marine Ways, Inc.

- Refractory concrete (made with LUMNITE cement) resists extreme variations in temperature and repeated thermal shock — gives longer service life to furnace parts and linings.
- Installation is fast, easy, economical — concrete reaches service strength in 24 hours.

For maximum convenience, use castables made with LUMNITE cement. These are packaged mixtures, ready for use. Simply add water, mix and place. Made and distributed by leading manufacturers of refractories.

For literature on refractory concrete, write: Universal Atlas, 100 Park Avenue, New York 17, N. Y.

L-170

UNIVERSAL ATLAS CEMENTS

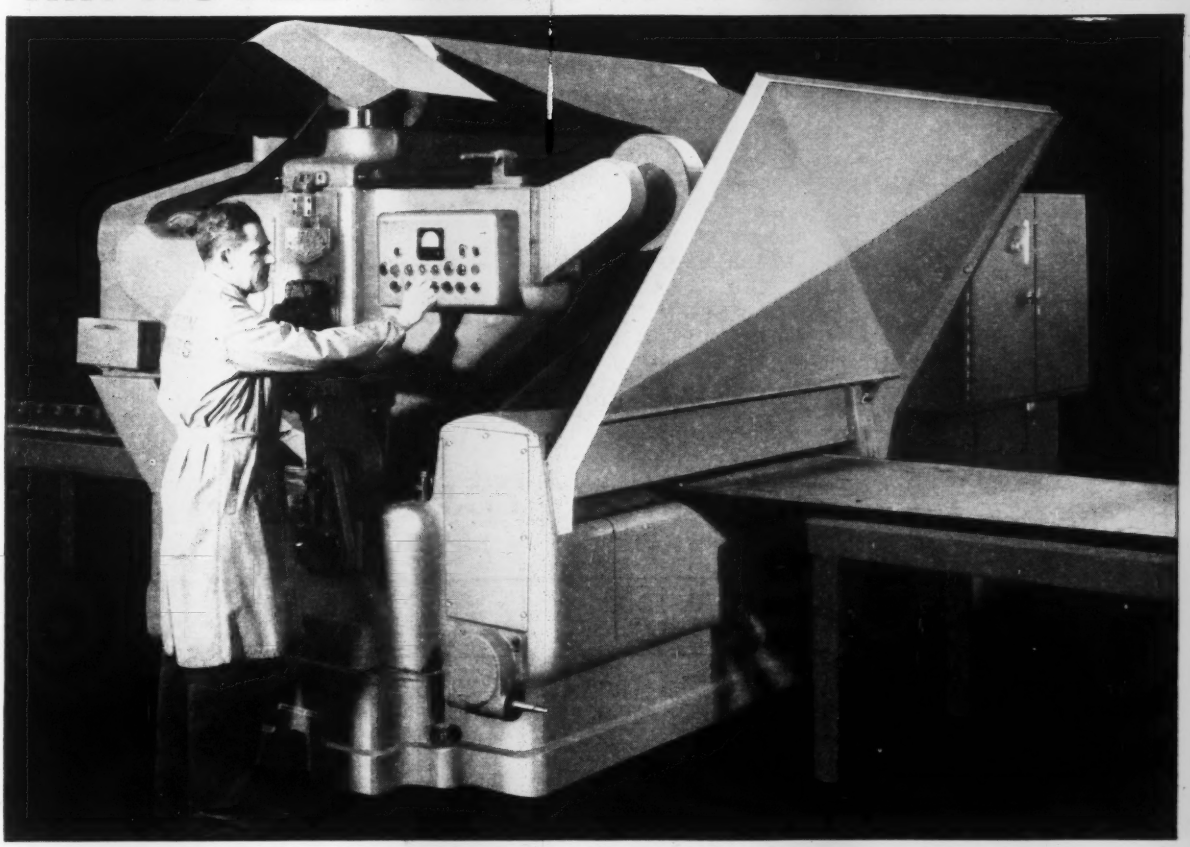
* **ATLAS and LUMNITE** *are registered trade-marks.*

Universal Atlas Cement
Division of United States Steel

USS
TRADE MARK

OFFICES: *Albany · Birmingham · Boston · Chicago · Dayton · Kansas City · Milwaukee · Minneapolis · New York · Philadelphia · Pittsburgh · St. Louis · Waco*

GRINDS SHEET STEEL OR STRIP TO IMPROVED FINISH IN A SINGLE PASS!



Rugged New Pinch Roll Grinder by Mattison eliminates chatter and revolution marks!

Put a stop to customer rejects and speed production of titanium, zirconium, stainless, and carbon steel sheets, plates, or strip . . . grind to correct gauge thickness . . . and make your production more automatic by installing this new Mattison No. 456 Pinch Roll Grinder. It's a heavier, more rugged machine capable of producing No. 3 finish with a 100 grit belt *in a single pass*. Diamond design improves belt performance and reduces belt cost. There's no vibration or chatter —you get high-quality finishes even on light-gauge steel. High horsepower permits you to grind accurately to size. Positive stops control parallelism within close limits. Photocell control of the grinding aperture (optional) prevents the leading edge of the sheet from marking the belt, eliminating "pickup" on subsequent sheets.

MATTISON MACHINE WORKS ROCKFORD, ILL. U.S.A.

HIGH-POWERED PRECISION SURFACE GRINDERS

NO. 455 RECIPROCATING TABLE SHEET POLISHER

Has same smooth, rugged head unit as No. 456. "Floats" sheets against contact roll for fine polishing.

Used in many plants for putting on a final finish after preliminary grinding on the No. 456.

SEND for *new* illustrative bulletin, with complete facts and features.

Mattison Machine Works
545 Blackhawk Park Avenue, Rockford, Illinois

- ☐ Please send bulletin on No. 456 Pinch Roll Grinder.
- ☐ Please send bulletin on No. 455 Wide-Belt Sheet Grinding and Polishing Machine.
- ☐ Please send literature describing Tube Grinders.

Name _____ Title _____

Company _____

Address _____

City _____ Zone _____ State _____

Castings of

ARMASTEEL

so tough they replace forgings
so machinable... they reduce
finishing costs

CLASSIFICATION	CHARACTERISTICS	HARDNESS (BHN)	MIN. TENSILE STRENGTH (PSI)	MIN. YIELD STRENGTH (PSI)	MIN. % ELONGATION IN 2 INCHES
ARMASTEEL GM 86M	Recommended for less highly stressed parts. Replaces steel parts in 1020-1035 S.A.E. range.	163-207	70,000	48,000	4.0
ARMASTEEL GM 85M	Recommended for moderate strength plus adaptability to selective hardening. Replaces parts in 1035-1050 S.A.E. range.	197-241	80,000	60,000	3.0
ARMASTEEL GM 84M	Recommended for high degree of strength. Replaces heat-treated parts in 1040-1050 S.A.E. range.	241-269	100,000	80,000	2.0
ARMASTEEL GM 88M	High resistance to wear and high yield strength, yet retains machinability. Requires no heat-treating and possesses same strength and wear characteristics as alloy steel forgings.	269-302	105,000	85,000	2.0

CENTRAL FOUNDRY DIVISION

Because ARMASTEEL castings are so machinable, so resistant to wear and shock, and so adaptable to selective hardening, they are rapidly replacing many parts formerly machined from bar stock or steel forgings.

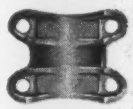
ARMASTEEL, a pearlitic malleable iron, possesses the same strength and performance characteristics usually associated with plain carbon steel. In addition, ARMASTEEL contains excellent bearing properties, has high yield strength, good damping capacity, maximum rigidity and excellent fatigue life. Accurate control of heat-treating operations in the manufacture of ARMASTEEL produces a fine, uniform grain structure and provides excellent finishing qualities.

Four different types of ARMASTEEL can be cast to your specifications. One of the four (GM 84M, GM 85M, GM 86M or GM 88M) will have the physical properties to best meet the requirements of your application. For example, ARMASTEEL castings are being successfully used in the automotive, appliance and implement fields for such parts as gears, pistons, crankshafts, rocker arms and universal joint yokes, all of which utilize to best advantage the outstanding characteristics of ARMASTEEL.

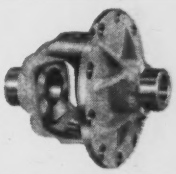
Some of these applications are shown in the table. Look them over carefully; you may find that these characteristics and advantages of ARMASTEEL can help reduce your costs . . . increase your production . . . and improve the performance of your products.

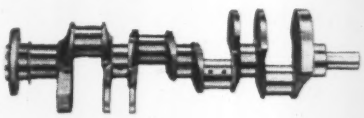
Typical ARMASTEEL castings

Because of the greater physical properties of GM 86M ARMASTEEL, it was possible to redesign this anchor plate as shown and effect a weight reduction from 2.26# per piece to 1.44# per piece.



GM 86M ARMASTEEL provides the ideal casting for this automobile differential case because of its high strength, minimum deflection and good damping qualities which contribute to quietness of operation. Note the as-cast internal cavity and the well-formed webs.



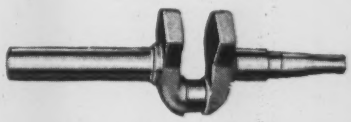


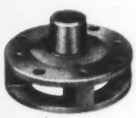
GM 85M ARMASTEEL provides a crankshaft with more desirable machining characteristics than a forged crankshaft of SAE 1045 steel. Improves machining of journals and reduces cheeking stock. Use of GM 85M ARMASTEEL made possible the redesign of the crankshaft with a resulting 3.5# weight reduction and a lower material cost.

By converting to GM 85M ARMASTEEL, drilling and boring operations were eliminated on this crankshaft sprocket. Stock in rough part was reduced from 1.93# in forging to 1.00# in casting. Customer realized reduced piece price with GM 85M ARMASTEEL.

GM 84M ARMASTEEL was specified for this socket plate journal because its microstructure makes it more easily machined than steel with the same physical properties. It has better bearing and wear resistance qualities . . . less distortion during machining . . . and does not require heat treatment. Weight of part in rough is less than comparable steel forging.

Crankshaft for newly designed small gasoline engine. GM 84M ARMASTEEL specified because of outstanding success in similar engines. Less stock removal and better machinability are advantages over forged crankshaft.





This planet gear carrier was formerly forged from SAE 1141 steel, which required a heat treatment after rough machining and broaching operations. By converting to GM 88M ARMASTEEL, heat treatment was eliminated and the weight of the rough part was reduced.

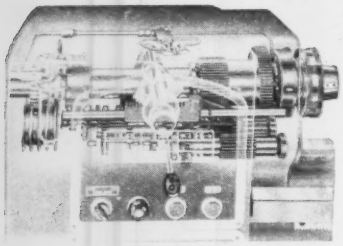
By converting to GM 88M ARMASTEEL for this universal joint yoke, hole thru hub could be cast in . . . eliminating a drilling operation and reducing weight of part approximately 30%. GM 88M ARMASTEEL part has lower piece price than forging formerly used.

85

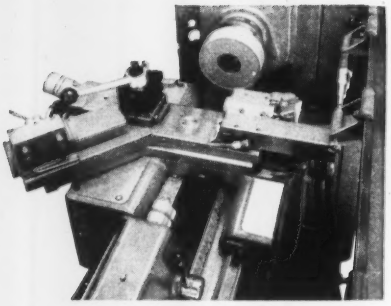
GENERAL MOTORS CORPORATION • SAGINAW, MICHIGAN • DEPT. 20

BIG

lathe features at low cost!



Full 5 HP—all spur gears—anti-friction bearings—automatic filtered lubrication—9 spindle speeds to 3000 RPM.

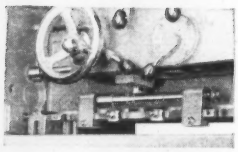


Compact, efficient 45° tracing mechanism—trouble-free, exclusive Lodge & Shipley design.

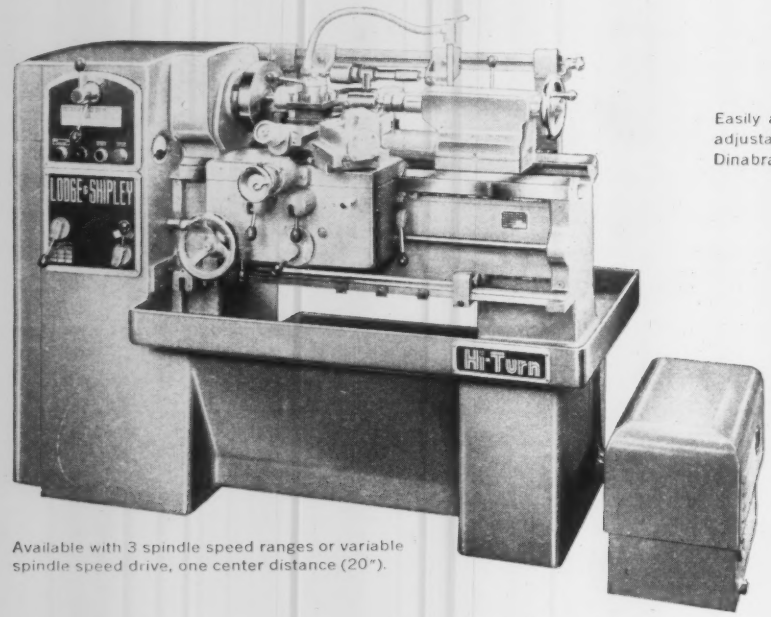
why pay $20,000 when you can buy a LODGE & SHIPLEY 1307 (10")

Hi-Turn COPYMATIC

TRACER LATHE for less than $10,000?

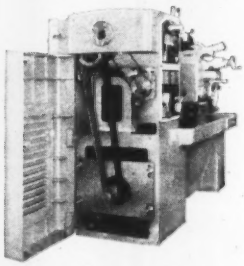


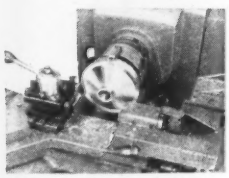
Template-type multiple length stops for duplicating shoulder lengths.



Available with 3 spindle speed ranges or variable spindle speed drive, one center distance (20").

Easily accessible and adjustable drive with Dinabrake motor.





Simple set-up for contour facing operations.

The **HI-TURN 45° COPYMATIC Tracer Lathe** is extremely rugged, built to do production jobs at time and money-saving rates. You get Lodge & Shipley quality features at a price substantially below many lathes having less horsepower and light construction. If you perform manufacturing or tracer lathe operations, put them on a lathe built to do the job at lowest cost. The features shown here are but a few of many . . . for complete details, request Bulletin DM-4 from:

The Lodge & Shipley Co., 3070 Colerain Ave., Cincinnati 25, Ohio

"We get higher recoveries with CHROMTEMP ferrochrome"

Closer chromium control and higher recoveries are obtained by adding CHROMTEMP exothermic ferrochrome to the ladle. Off grade heats are minimized, which means higher plant profits. In addition, this alloy does not preferentially oxidize aluminum added for grain size control. CHROMTEMP ferrochrome is available in three grades which add 5, 8 or 12 points of carbon respectively with each 1% of chromium added. For further information call your ELECTROMET representative.

ELECTRO METALLURGICAL COMPANY, Division of Union Carbide Corporation, 30 East 42nd Street, New York 17, N. Y.

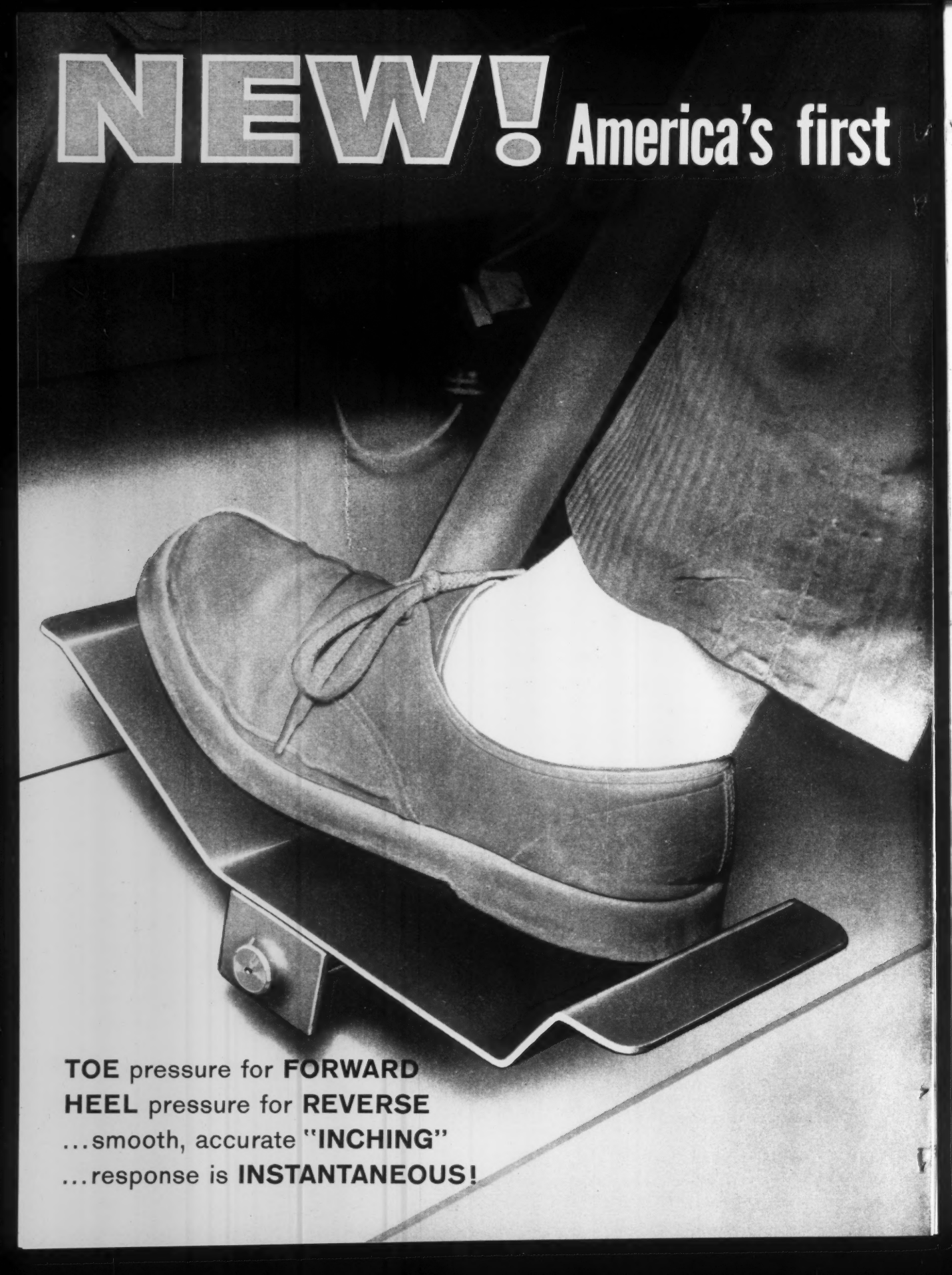
Write for this folder on cost savings with CHROMTEMP ferrochrome.

Electromet
FERRO-ALLOYS AND METALS

UNION CARBIDE

The terms "Chromtemp," "Electromet," and "Union Carbide" are trade-marks of Union Carbide Corporation.

NEW! America's first



TOE pressure for **FORWARD**
HEEL pressure for **REVERSE**
...smooth, accurate **"INCHING"**
...response is **INSTANTANEOUS!**

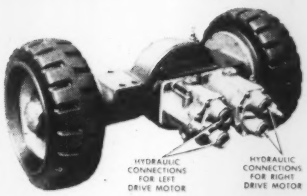
foot-controlled power transmission!

Unique method of instant power application introduced in Towmotor Fork Lift Trucks

TOWMOTOR *TOWMOSTATIC* DRIVE

It's really history-making!

NO clutch assembly
transmission
drive line
differential
gearshift lever



Twin Motors Power Drive Wheels!
Two positive-action piston-type motors transmit full power to drive wheels. Due to variable displacement characteristics of the motors they automatically adjust to torque and speed requirements demanded by driving conditions.

Towmostatic Drive is a Towmotor engineering achievement based on the principle of Hydrostatics . . . an entirely new method of pedal-controlled power transmission that simplifies lift truck operation, reduces hand movements to minimum, cuts maintenance costs and downtime sharply.

With this new drive Towmotor lift truck operators control *all forward and reverse travel* with their left foot on a treadle-type pedal—a natural heel-and-toe action. To go forward, simply press down with toe. To reverse, press down with heel. Response is instantaneous and glider-smooth operation is easily mastered with a few minutes' practice!

Conventional mechanisms eliminated

Towmotor Towmostatic Drive is the first method of power transmission to eliminate clutch assembly, transmission, drive line, differential, plus entire shifting mechanism. Many of the major causes of costly maintenance and downtime are thus eliminated.

Operating benefits are many

Smooth, accurate "inching" that simplifies stacking of goods is also obtained through Towmotor Towmostatic Drive. Maneuverability is unsurpassed—acceleration fast—gradeability greatly improved—lifting speed is integrated with drive control for maximum mass-handling.

Ask for Towmostatic Drive Booklet

Complete information on this revolutionary Towmotor power transmission is detailed in new illustrated booklet. Write to Towmotor Corporation, Cleveland 10, Ohio.

Leaders for 39 years in building Fork Lift Trucks, Tractors and Carriers

TOWMOTOR -GERLINGER
THE ONE-MAN-GANG

Gerlinger Carrier Company is a subsidiary of Towmotor Corporation, Cleveland 10, Ohio

new Fairchild F-27 have the "mettle in their

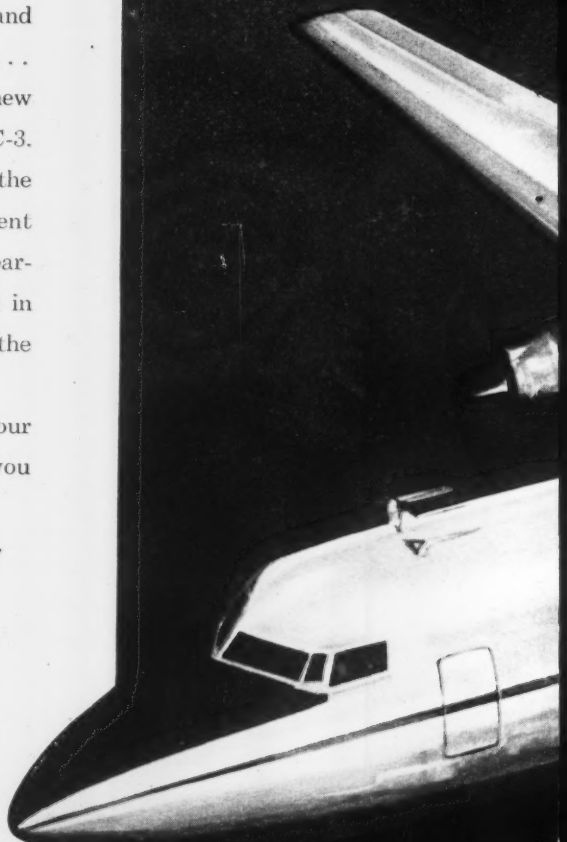
First American propjet transport designed for short and medium-range operators . . . both airline and corporate . . . the new F-27 is the proven successor to the famed DC-3.

From design to production, the best brains and equipment in the aircraft industry have been employed for 5 years in the development of this new plane. So it follows that Morse Cutting Tools . . . particularly Morse Aircraft Drills and Router Bits . . . were used in construction. Because it *takes* quality to *make* quality . . . and the mettle of Morse Tools is a *known quantity*.

Likewise, on *your* own cutting tool needs, it pays to mark your orders "Morse". Let your Morse-Franchised Distributor show you exactly why. Call him today.

MORSE TWIST DRILL & MACHINE COMPANY
NEW BEDFORD, MASSACHUSETTS
A division of VAN NORMAN INDUSTRIES, INC.
Warehouses in New York, Chicago, Detroit, Dallas, San Francisco

The F-27 is made in the USA by Fairchild Engine & Airplane Corp., Hagerstown, Md. Cruising speed, 280 mph. Range up to 2500 miles. Takeoff distance, 3680 ft.

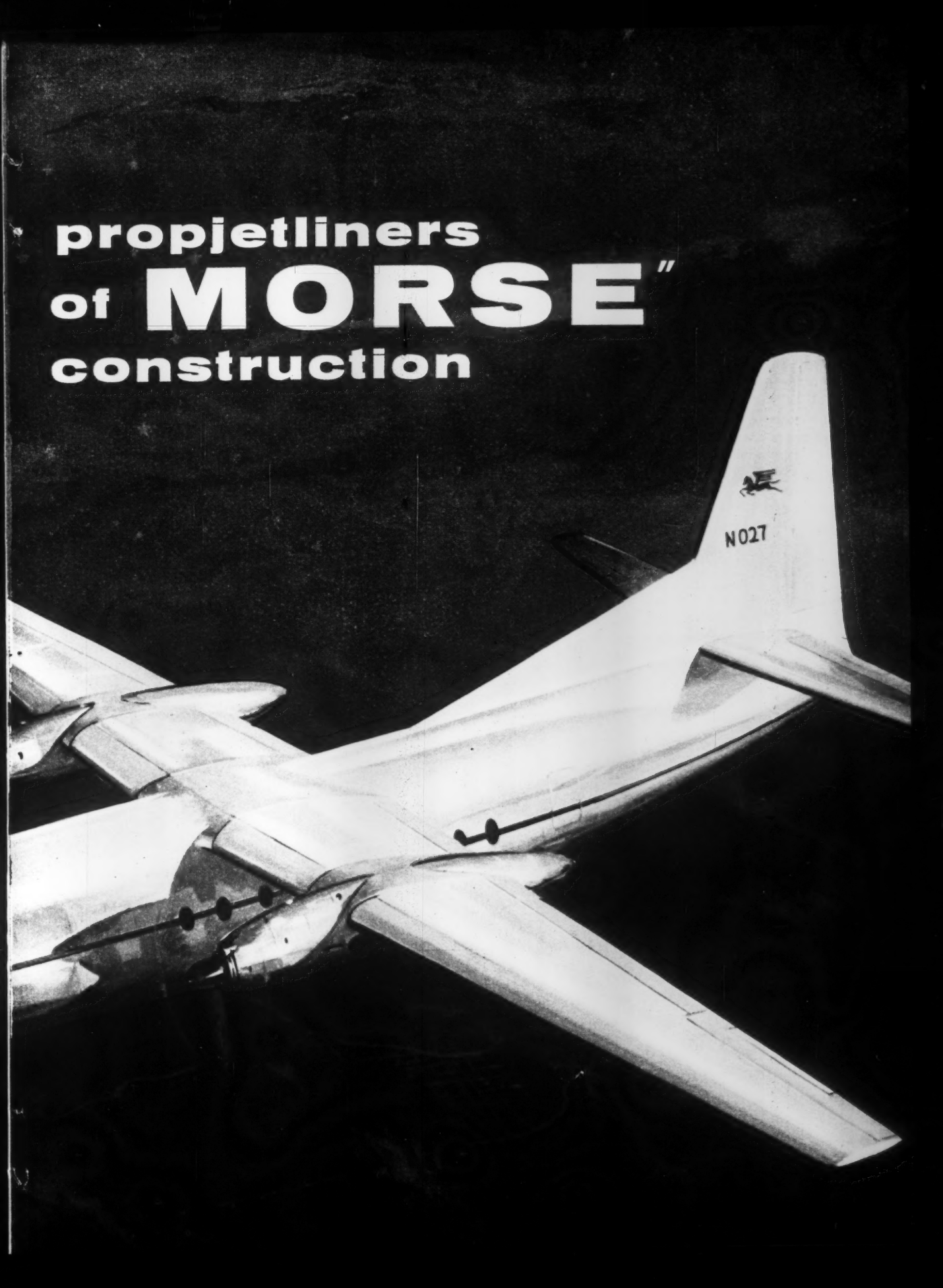


. . . in Cutting Tools

MORSE

means "THE MOST"

propjetliners of MORSE" construction



Republic ELECTRUNITE Mechanical Tubing

...facilities and abilities save production time, materials, costs!

This story is a typical example of how Republic's ELECTRUNITE® Mechanical Tubing—in rounds, squares, rectangles, can work for you.

Syncro Corporation, Oxford, Michigan, manufactures quality jig saws for home workshops. Previously, they used a casting for the blade-yoke which requires a severe bend. ELECTRUNITE Square Tubing was recommended for one model, rectangular tubing for the other.

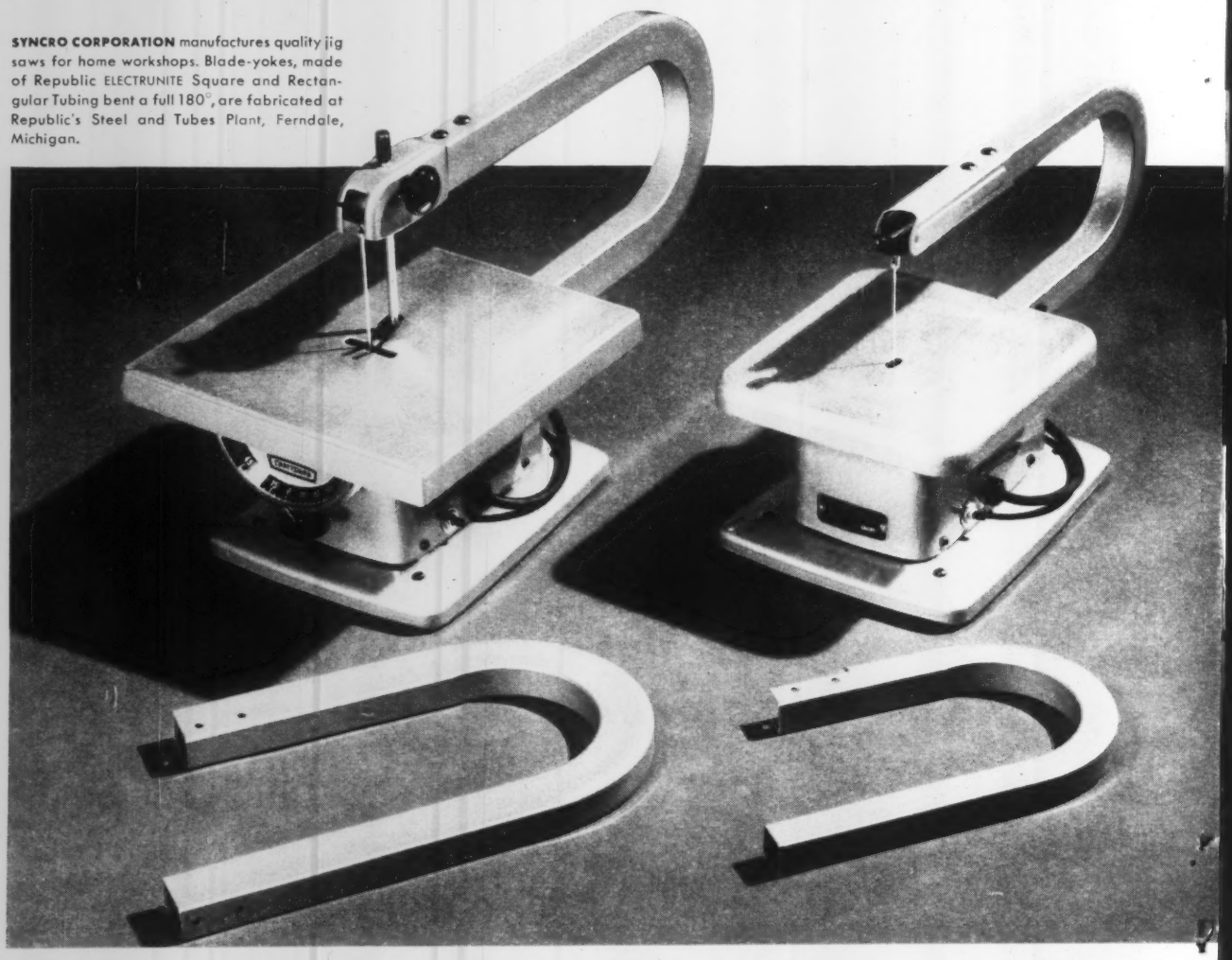
Results: Reduction of weight of the blade-yoke and improvement in the appearance of the product, at a savings in time, materials, assembly, and shipping costs.

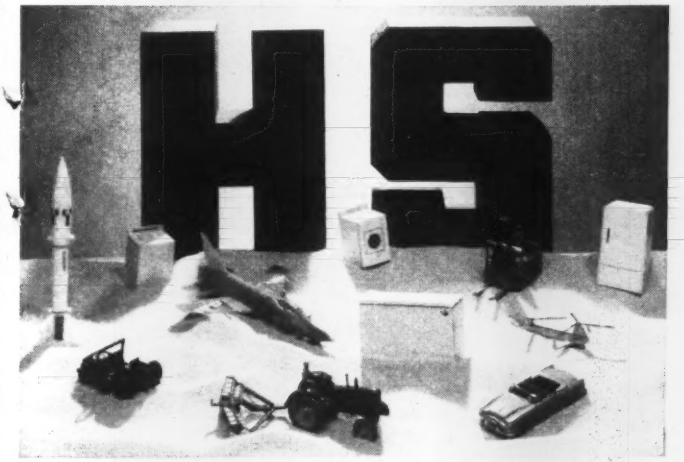
ELECTRUNITE solved this problem because Republic Mechanical Tubing is produced with the ability to withstand severe bending. In both models, ELECTRUNITE Mechanical Tubing is bent a full 180° without noticeable distortion or loss of strength.

Republic's Steel and Tubes Division has the facilities, equipment, and "know-how" to fabricate all grades and types of ELECTRUNITE carbon and stainless tubing into whatever shapes your product requires.

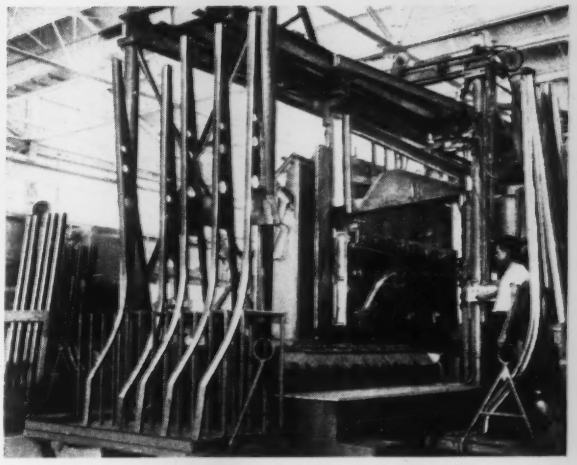
Learn more about the problem-solving advantages of Republic ELECTRUNITE Mechanical Tubing. Call your Republic representative, or write direct.

SYNCRO CORPORATION manufactures quality jig saws for home workshops. Blade-yokes, made of Republic ELECTRUNITE Square and Rectangular Tubing bent a full 180°, are fabricated at Republic's Steel and Tubes Plant, Ferndale, Michigan.



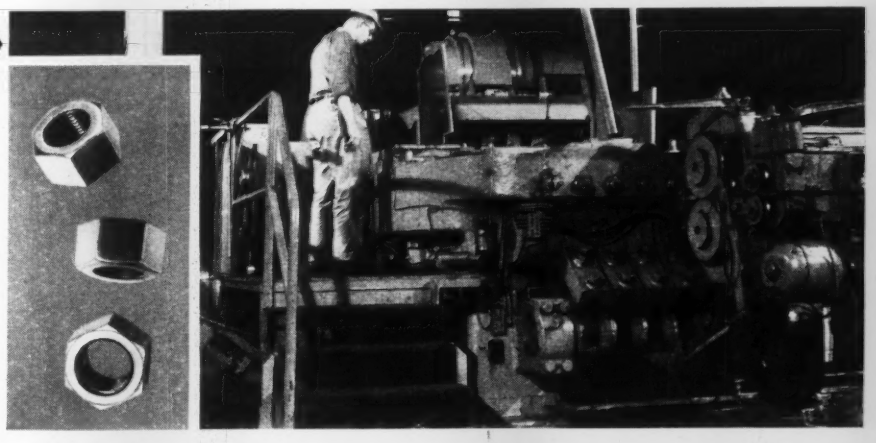


REPUBLIC'S NEW HIGH STRENGTH POWDER, TYPE 6460, opens the way to new markets for new applications using sintering for highly stressed parts. Type 6460 can be used with existing operating equipment. It provides a minimum tensile strength of 60,000 psi at 6.4 density as sintered, 100,000 psi heat treated. Type 6460 maintains its dimensional characteristics after sintering—less than .004 inches per inch shrinkage from die size at 6.4 density. Available in production quantities up to and including 12 tons, or in multiples thereof. Mail coupon for data.



REPUBLIC ALLOY STEEL SOLVES STRENGTH/WEIGHT PROBLEM. Rohr Aircraft Corporation, Chula Vista, California, is currently manufacturing flap tracks for an Air Force bomber fabricated from AMS 6428 Alloy Steel, with minimum tensile strength of 180,000 psi in the heat treated condition. Uniform response to heat treatment assures exceptionally deep hardening characteristics. Exceptionally high strength-to-weight ratio combined with highest strength values permits the design of thinner, lighter track sections. Save weight, hold down size without sacrifice of strength or safety. Send coupon for data.

THERE IS SATISFACTION in knowing that when you specify Republic Fasteners, you can count on consistent uniformity from one unit to the next, year in and year out. You get unswerving quality and dependability in each fastener, in any quantity. Skilled workmen, using modern production equipment like the nut former shown at right, maintain uniform quality in each type of fastener. Your Republic Bolt and Nut Division representative or distributor will be glad to work with you to make sure you get exactly the right fastener to suit your application. Send coupon for full information on types and sizes.



REPUBLIC STEEL

World's Widest Range of Standard Steels and Steel Products

REPUBLIC STEEL CORPORATION
DEPT. ST-6445
1441 REPUBLIC BUILDING • CLEVELAND 1, OHIO

Please send additional information on the following:

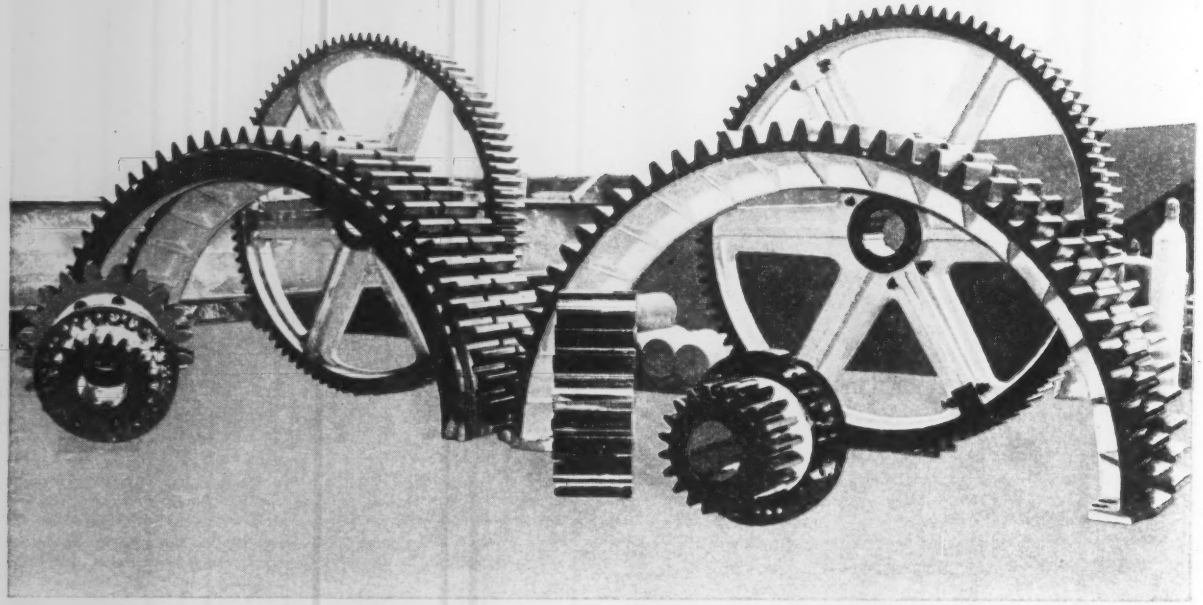
- ☐ Republic ELECTRUNITE Mechanical Tubing
- ☐ Republic High Strength Powder, Type 6460
- ☐ Republic Alloy Steel
- ☐ Bolts and Nuts
- ☐ Have a metallurgist call

Name_____ Title_____

Company_____

Address_____

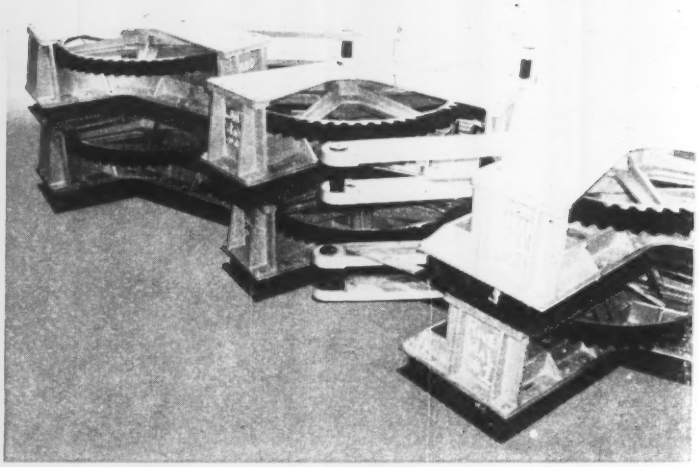
City_____ Zone____ State_____



large cast steel gears to your designs and specifications

by AVONDALE

Avondale's Service Foundry Division manufactures cast steel gears (plain or alloyed) to 15′ diameter and 30″ face. Gear teeth are cut without limitation to tooth form or size on Service Foundry's large Gleason gear planer. Cast tooth gears are also manufactured regularly. For your next gear order, consult Service Foundry NOW! Write for our illustrated brochure, *Foundry Work—Steels, Alloys & Non-Ferrous, Vol. 6.*



AVONDALE

MARINE WAYS, INC.

VERSATILE BUILDER ON THE MISSISSIPPI

P. O. BOX 1030 • PHONE UNiversity 6-4561 • NEW ORLEANS 8, U. S. A.

people buy Scott Wipers for many reasons:

Mr. Swenson reports: "Prat-Daniel uses Scott Wipers for wiping bearings and shafts in the balancing department; for wiping steel plate prior to layout and processing; for wiping up oil and grease; for cleaning welders' face masks, and many other tough jobs."

Prat-Daniel says: "We save 40% annually with Scott Wipers... and eliminated a fire hazard!"

The Prat-Daniel Corporation, South Norwalk, Connecticut, makes fan-stacks, fans, tubular and spiral dust collectors. Mr. Inge Swenson, General Superintendent, tells us: "We used waste before, and employees got the habit of letting oil-soaked heaps of waste accumulate. Now we dispose of Scott Wipers daily." As Mr. Swenson says, much work here is of a dirty, grimy nature, and employees like soft, absorbent Scott Wipers fresh from the box each time for wiping hands and face. Scott Wipers were first tested for 2 months in the bearings department —considered the toughest test—and their success here led to use throughout the plant. Annual savings: 40%.

SCOTT PAPER

Get the Prat-Daniel case history and others, covering many fields, from your Scott distributor (Yellow Pages: "Paper Towels"). Or write: Scott Paper Company, Department S-810, Chester, Pa.

Maker of the famous Scott paper products you use in your home.
See "Father Knows Best" on CBS-TV.

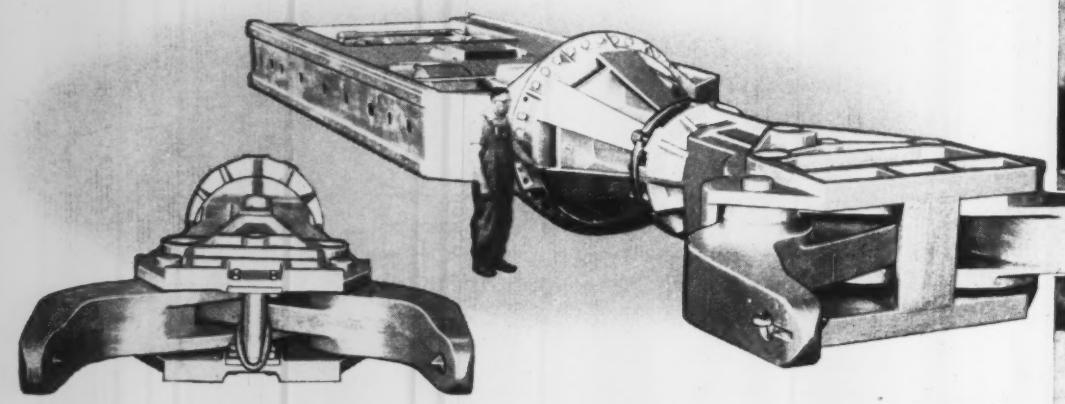
WORLD'S LARGEST

• This 75-ton intensified grip soaking pit crane installed at the Lukens Steel Company, Coatesville, Pennsylvania, has more than twice the capacity of any soaking pit crane ever built.

The complete range of slabs and ingots produced, from 30″ minimum to 125″ maximum, is handled by two tong heads which can be interchanged in a matter of minutes. If your material-handling problems involve big lifts or transfers, Alliance engineers in Alliance or Miami will solve them . . . quickly and economically.

INTERCHANGEABLE TONG HEADS

• To afford better visibility when handling small ingots, the small tongs can quickly be installed on the column. These small tongs have a range of 30″ minimum to 86″ maximum. Range of the large tongs is 65″ minimum to 125″ maximum.

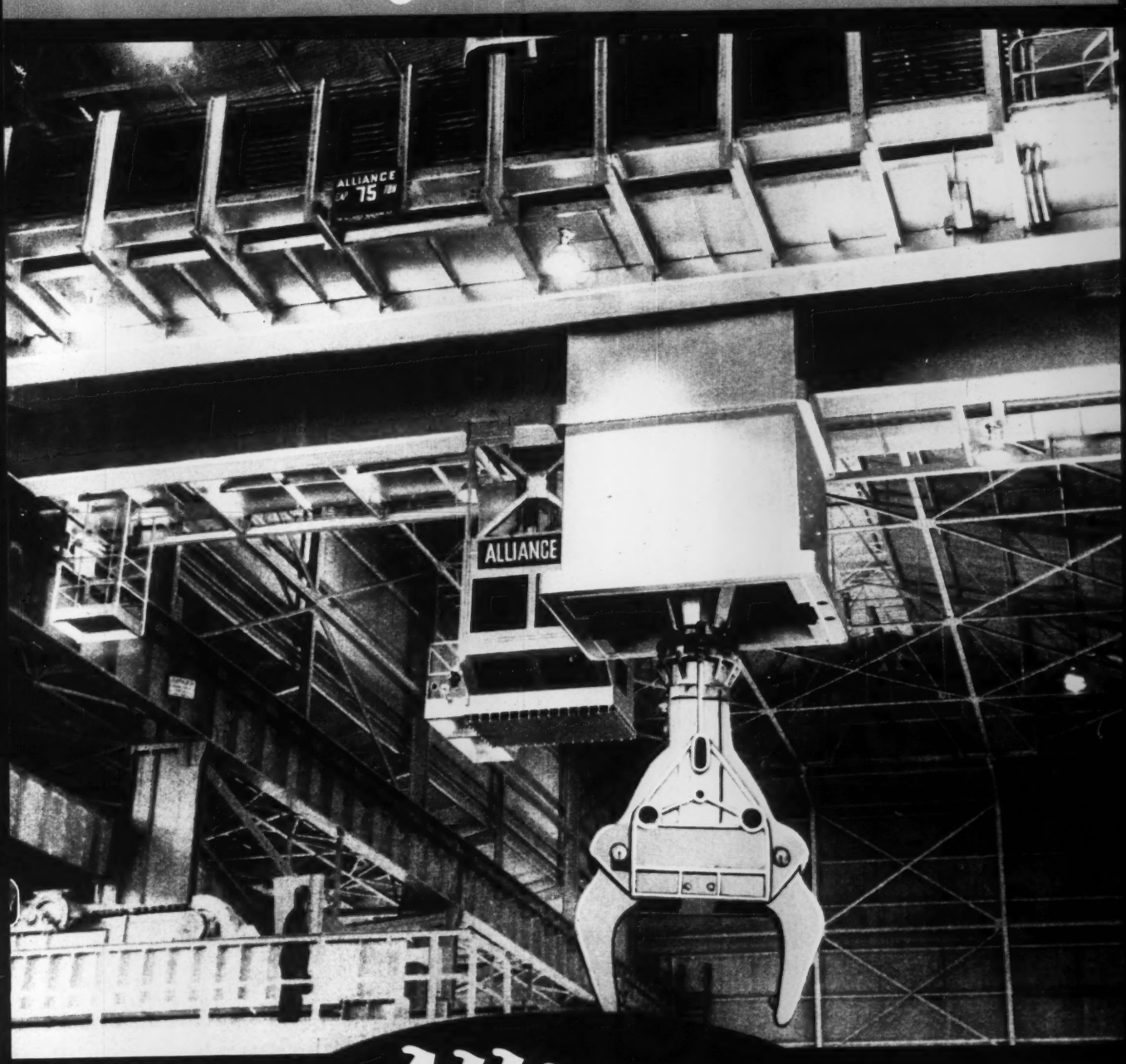


THE ALLIANCE MACHINE COMPANY

Main Office • Alliance, Ohio **Branch Office • Miami, Florida**

"GIVE US THE RUNWAY AND WE'LL LIFT THE WORLD"

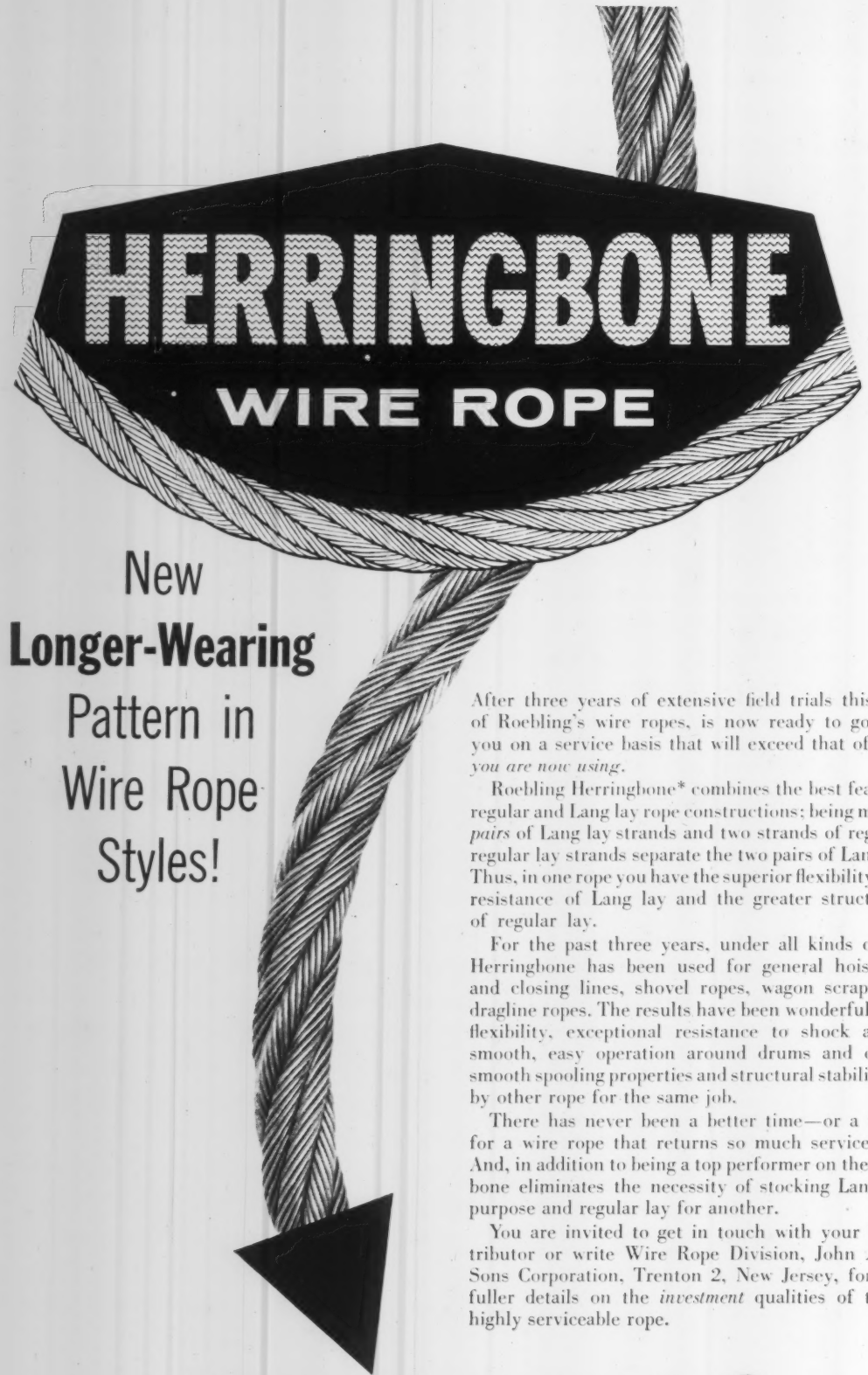
Soaking Pit Cranes



Alliance

Photo Courtesy Lukens Steel Company, Coatesville, Penna.

LADLE CRANES • GANTRY CRANES • FORGING MANIPULATORS • SOAKING PIT CRANES • STRIPPER CRANES • SLAB & BILLET CHARGING MACHINES
OPEN HEARTH CHARGING MACHINES • SPECIAL MILL MACHINERY • STRUCTURAL FABRICATION • COKE PUSHERS • LOADING AND UNLOADING TOWERS



New **Longer-Wearing** Pattern in Wire Rope Styles!

After three years of extensive field trials this, the newest of Roebling's wire ropes, is now ready to go to work for you on a service basis that will exceed that of *the wire rope you are now using.*

Roebling Herringbone* combines the best features of both regular and Lang lay rope constructions: being made up of two *pairs* of Lang lay strands and two strands of regular lay. The regular lay strands separate the two pairs of Lang lay strands. Thus, in one rope you have the superior flexibility and abrasion resistance of Lang lay and the greater structural stability of regular lay.

For the past three years, under all kinds of conditions, Herringbone has been used for general hoisting, holding and closing lines, shovel ropes, wagon scraper ropes and dragline ropes. The results have been wonderful . . . excellent flexibility, exceptional resistance to shock and abrasion, smooth, easy operation around drums and over sheaves, smooth spooling properties and structural stability unequalled by other rope for the same job.

There has never been a better time—or a wider need—for a wire rope that returns so much service for its cost. And, in addition to being a top performer on the job, Herringbone eliminates the necessity of stocking Lang lay for one purpose and regular lay for another.

You are invited to get in touch with your Roebling distributor or write Wire Rope Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey, for further and fuller details on the *investment* qualities of this new and highly serviceable rope.

*Reg. appl. for

ROEBLING

Branch Offices in Principal Cities • Subsidiary of The Colorado Fuel and Iron Corporation

THREADING AT 581 R.P.M.

Suburban Industries, Bensenville, Ill., is achieving these results with a LANDMACO 5C Threading Machine equipped with a 5/8" VVV LANCO Hardened and Ground Die Head. Both steel studs and continuously-threaded bars are produced at 581 r.p.m.

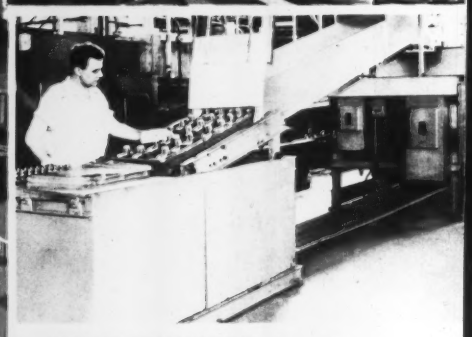
Chaser life is excellent. For example: 10,000 studs of B 1113 steel, having a 1/2" UN thread 3/4" in length, are produced between chaser grinds. In the rod application, with 1/2" 13 pitch UN threads in 12-foot lengths, 150 bars of B 1113 steel are produced between chaser grinds.

The 5C LANDMACO Machine is manufactured in a single-spindle model for threading all diameters from 3/16" to 5/8" to Class 4 fit. Lead screw and air-operated equipment available to increase machine efficiency. 518

LANDIS *Machine* COMPANY

WAYNESBORO • PENNSYLVANIA

HEAT



1. BRIGHT ANNEALING furnace reduced many machining costs.

FROM GENERAL ELECTRIC CAN CUT COST, IMPROVE QUALITY OF YOUR PRODUCT, TOO

General Electric furnaces speed production, cut rejects, reduce maintenance costs in hundreds of processing jobs. Your decision to call G-E heat experts *now* can save you money today and for years to come.

Nearly any product, like those shown at left, can be made better and at less cost through a heat processing modernization plan set up by General Electric. The savings you realize can pay off the initial cost of the system in two to three years—you get extra profits in years to come, cost-savings and a more saleable product today.

Here are four examples of the results achieved through the use of G-E heat processing equipment (pictured below):

1. SAVINGS OF 25 TO 50% in the manufacture of high quality stainless steel parts were realized as a result of bright annealing in General Electric furnaces in a Midwest heat treating plant. Two years of high-speed processing with virtually no maintenance and with low operating cost have resulted in high investment return and improved products.

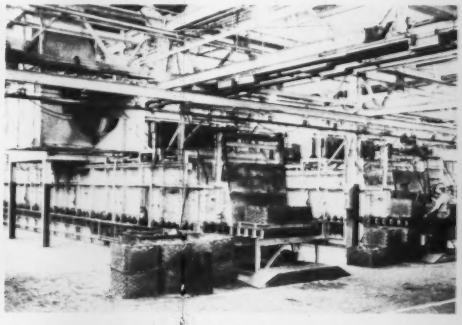
2. PICKLING WAS ELIMINATED by bright brazing stainless steel parts in a General Electric semi-continuous tubular retort furnace. Bright, shiny parts of high quality are now produced in less time, at lower cost.

3. 75% SHORTER ANNEALING CYCLES—malleable-iron annealing with automatically-controlled General Electric roller-hearth furnaces cut cycle from 4 days to 48 hours, cut man-hours 40% for a Midwest concern. Straight-line, continuous annealing boosted process rate to 32 tons of high-quality castings every day and eliminated heat-up and cool-off time formerly required by old oil-burning furnaces.

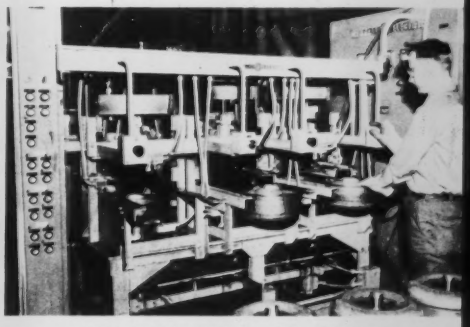
4. 300% FASTER HARDENING of transmission components is made possible by a General Electric electronic induction heater in an automotive plant. Parts enter one end, progress on rollers to the other end and are flipped over for hardening of the reverse side at the rate of one every six seconds. Higher quality products are produced.

You can achieve results like these with a heat modernization system planned by General Electric to fit your needs. If you suspect that obsolete heat processing equipment is robbing you of profits, call your G-E Apparatus Sales Office. A qualified Heating Specialist will quickly figure your present costs, and your potential savings. Why not call today? Section 721-11, General Electric Company, Schenectady 5, New York.

2. BRIGHT BRAZING FURNACE eliminated all pickling costs.

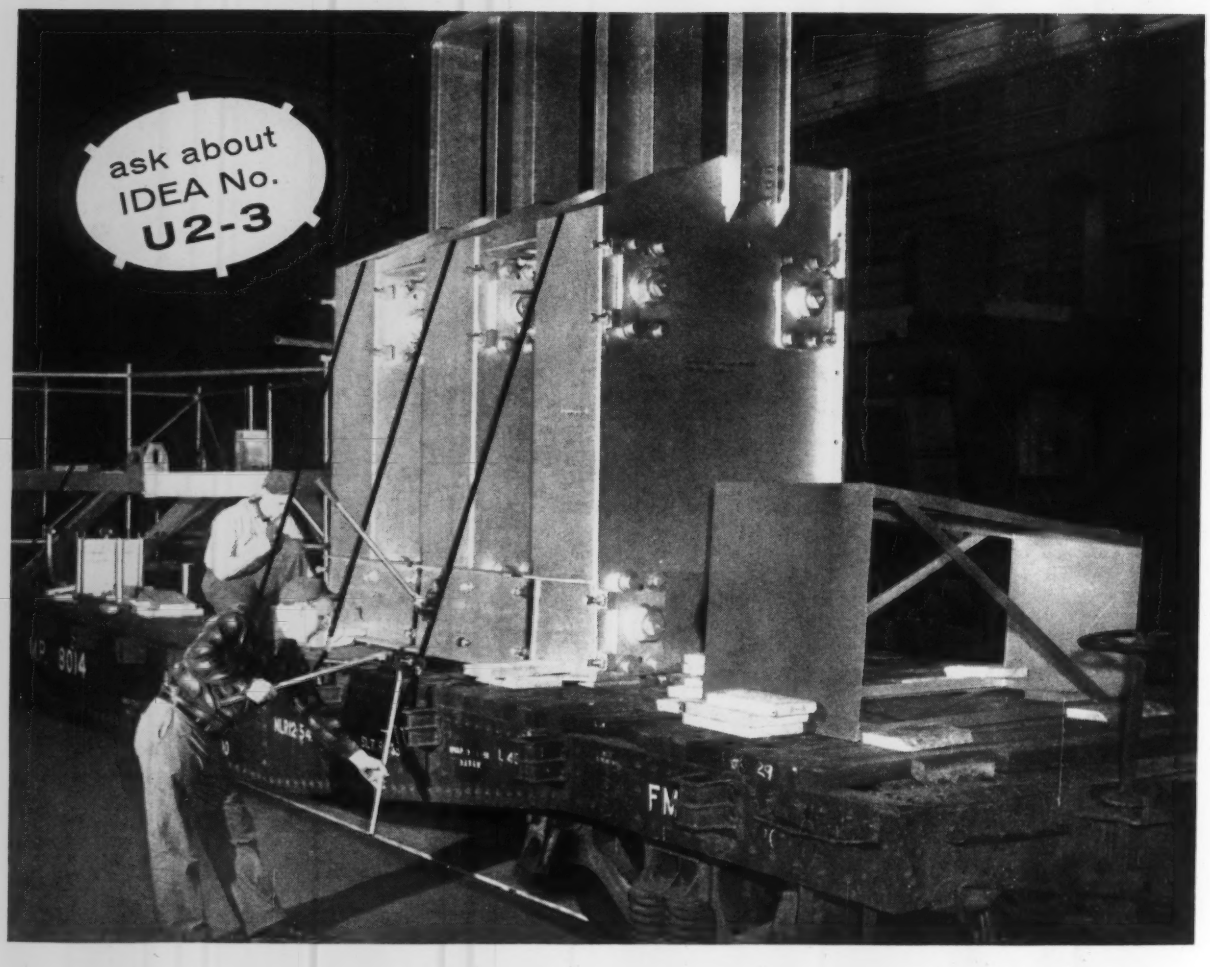


3. CONTINUOUS ANNEALING FURNACE cut malleable-iron annealing cycle 75%.



4. INDUCTION HEAT TREATING increased production by 300%.

GENERAL ELECTRIC



Consult your AIM*. . . Whiting Corporation does . . .

Acme Steel Strapping protects electric furnace shipment

When the world's largest electric copper melting furnace left the shops of its manufacturer, Whiting Corporation, Harvey, Illinois, it was securely braced and protected for flatcar shipment with heavy-duty Acme Steel Strapping. It arrived without damage, shifting, or delays en route for securement adjusting. (Idea No. U2-3)

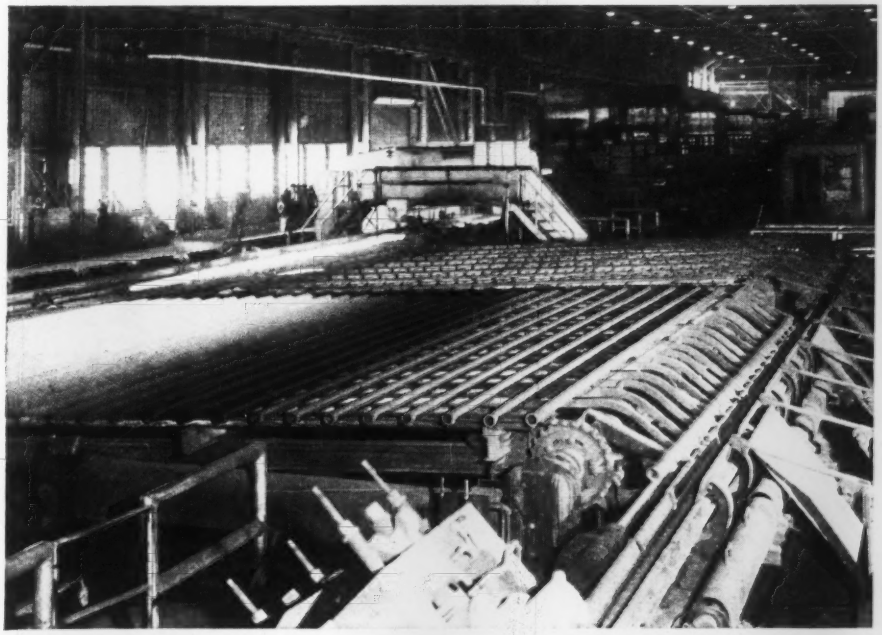
Whiting Corporation relies on heavy-duty Acme Steel Strapping to tie-down and protect rail shipments of all heavy industrial machinery and equipment it manufactures. Shipments are loaded and secured with steel strapping in less than half the time required by the former method of using threaded steel rods that had to be shaped to fit the loads. And a crew of only two men, instead of three, can do the job, releasing a man for other plant duties.

Acme Idea Man Andy Bassi helps Whiting Corporation solve its carloading problems.

***Consult your Acme Idea Man** for advice on ways to better protect your products for handling, shipping, storage. His Ideas-in-Action files contain scores of performance-proved Ideas that can be adapted to meet your needs. Write Dept. SDU-108, Acme Steel Products Division, Acme Steel Company, Chicago 27, Illinois. In Canada, Acme Steel Company of Canada, Ltd., 743 Warden Ave., Toronto 13, Ontario.

ACME STEEL **STEEL STRAPPING**

Many metal working operations need the extra qualities of Promal chain



LINK-BELT H CLASS PINTLE CHAIN with pusher attachments on this pipe cooling rack designed by Aetna-Standard Engineering Co. receives white-hot pipe from finishing operations in a continuous butt weld mill. Controlled chain speed permits uniform cooling of outer tube periphery.

Specially heat-treated malleable iron resists heavy and abrasive loads

Fewer conveyor shutdowns and minimized replacements are economies realized by users of Link-Belt Promal chain. Promal will withstand repeated cyclic heating up to 1000° F. Its greater strength absorbs continuous impact loads, and high wear resistance supplies the durability to cope with severe abrasion.

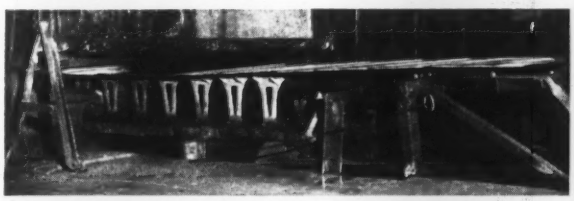
A Link-Belt Development

Promal is more than a partially annealed or surface-hardened malleable iron. Developed by Link-Belt, this specially heat-treated malleable iron is actually transformed into a metal of radically different physical properties. Promal, because of uniform microstructure throughout its whole section, provides greater ultimate strength, higher yield point, exceptional fatigue resistance.

Where and how to apply Promal in the metal working industry

Choose Link-Belt Promal chains for highly abrasive or heat-conditions—for extra strength and wear resistance demanded by heavy loads or long sliding conveyors. They last much longer . . . cost but a little more.

The wide range of Link-Belt chains available in Promal includes all types of cast and combination chains.



SMGL-618 PROMAL chain conveyor is another example of the applicability of heat-resistant Promal in the metal working industry. This chain conveyor with special joint design and riser attachments picks up and conveys sheet steel through furnace. Chain has operated continuously for two years without failure. The heat-resistant properties of Promal also make it a desirable material for use on low-temperature heat-treating equipment.

PHYSICAL PROPERTIES OF PROMAL

Compare this with other ferrous materials used for chain applications.

Yield Point	55,000 pounds per sq. in.
Ultimate Strength	75,000 pounds per sq. in.
Fatigue Strength	35,000 pounds per sq. in.
Elongation	10 to 14% in 2 inches
Average Brinell Hardness	170 to 190

PROMAL'S high strength factors make it ideal for the especially long elevators and conveyors employed in the metal working industries.

HEADQUARTERS for Link-Belt products is your nearby Link-Belt factory branch store or authorized stock-carrying distributor. Refer to the yellow pages of your local phone directory.

LINK-BELT

CHAINS AND SPROCKETS

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office: New York 7; Canada, Scarboro (Toronto 13), Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World. 14.923

Digs More . . *4,500 lbs. breakout force*

Carries More . . *2,500 lbs. carry capacity*

Delivers More . . *with power-shift*

. . than ever before!

All-New H-25 PAYLOADER®

Ask about . . .

PURCHASE AND HOUGH LEASE PLANS

Now your Hough Distributor has at his disposal the broadest and most complete set of financing plans ever offered: — TIME PAYMENT . . . LEASING PLANS, with or without OPTION TO PURCHASE — any and all kinds of financing to best fit your needs.

THE FRANK G. HOUGH CO.
876 Sunnyside Ave., Libertyville, Ill.

Send complete data on the outstanding new model H-25 "PAYLOADER".

Name _____

Title _____

Company _____

Street _____

City _____

State _____

6-A-1L

The most important fact about this outstanding new machine is that it will handle more material per hour and at less cost per ton than any front-end loader anywhere near its size.

It has a carry capacity of 2,500 lbs. with a wide range of operating speeds, yet it goes in and out of boxcars with 6-ft. doors to load or unload them.

The two-speed full-reversing power-shift transmission with torque converter and its power steering are big reasons why it can produce all-out all day without operator fatigue.

There are many other features that put the H-25 in a class by itself . . . in productivity, ease of operation and low maintenance. A variety of attachments, quickly interchangeable with the bucket, are also available to handle many other materials besides bulk loads.

Your Hough Distributor is ready to show you that the H-25 can dig more, carry more and deliver more bulk than you ever saw this size of machine handle before.

SAY "HUFF"

Modern Materials Handling Equipment

THE FRANK G. HOUGH CO.

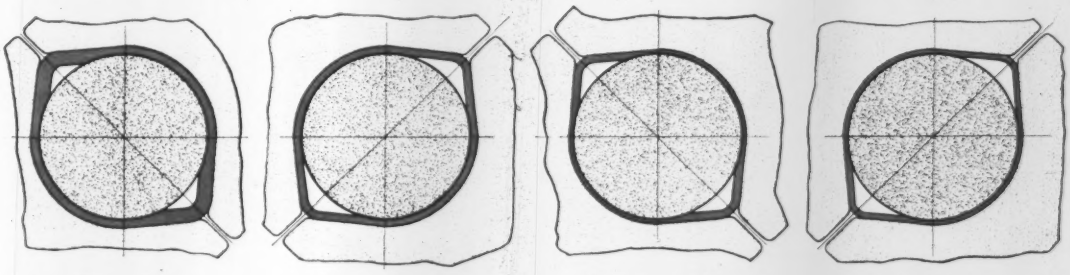
LIBERTYVILLE, ILLINOIS

SUBSIDIARY—INTERNATIONAL HARVESTER COMPANY

TIPS FROM A ROLL MAKER'S NOTEBOOK

MACKINTOSH-HEMPHILL DIVISION, E. W. BLISS COMPANY, Pittsburgh 3, Pennsylvania

Cast mill rolls • Johnston cinder pots • rotary tube straighteners • end-thrust bearings • heavy-duty lathes • steel and special alloy castings



STAND THREE STAND FOUR STAND FIVE STAND SIX

Severe service conditions at pass edges are shown graphically by these sectional diagrams of various stands of a nine-stand mandrel mill.

Solutions to some hole-rolling problems

Obviously, there is no single roll analysis to solve all seamless tube mill rolling problems. Nevertheless, in general, once the round has been pierced, the qualities needed in rolls for the later stands—whether the mill be a mandrel mill or a plug mill with reeling and sizing stands—are similar, varying only in degree.

Mandrel mills should get the best—Usually, the most severe operating conditions are to be found in mandrel mills. The rolls must provide high strength, uniform high hardness, resistance to slippage and freedom from scale pickup. The latter quality is especially important in this kind of mill, since the metal of the tube wall is being squeezed between the rolls and the traveling mandrel. We recommend *Midland Superalloy* nickel-chromium-molybdenum alloy steel rolls for this service. Their graphite-free composition and ability to be heat treated to high hardness levels makes them exceptionally resistant to spalling and fire cracking. Hence, they deliver pipe and tubing of top quality, providing long production runs between redressings.

The plug rolling mill process is easier on rolls—Plug mills (high mills), with their following reelers and sizers, place less severe demands on the rolls they use. The reeling stands spread the work over a fairly wide face, and the sizing stands are limited in the amount of reduction they can take by the tendency of the tube wall metal to upset. *Technigrain* or *Nironite AX* alloy iron rolls have the depth of hardness penetration and smoothness of surface needed to provide even wear throughout a complete plug mill set-up. In certain cases, *Technikrome* alloy steel rolls provide the additional strength sometimes needed in the high mill itself.

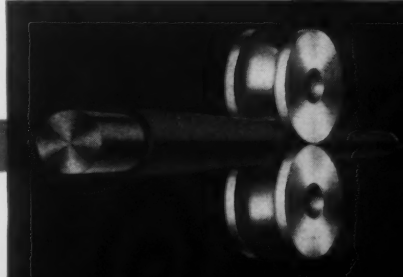
Whether or not your rolling facilities include seamless tube mills, you'll find that Mack-Hemp can offer you helpful, cost-saving advice on all matters of roll selection and use. Why not call or write us today?

MACKINTOSH-HEMPHILL

You get more tonnage from the rolls with the Striped Red Wabblers

Division of E. W. BLISS COMPANY

Presses, Rolling Mills, Special Machinery



GREAT LAKES STEEL ANNOUNCES ITS NEW GLX-W STEELS...

The Great Lakes Family of High-Strength Steels

N-A-X FINEGRAIN STEEL

Lets you design superior performance, longer life and less weight into your product. Many diversified applications.

N-A-X HIGH-TENSILE STEEL

Offers all the characteristic features of N-A-X Finegrain, plus greatly enhanced resistance to atmospheric corrosion.

GLX W

A series of fine grained, mild carbon steels. They have unusually high strength, toughness and weldability.

N-A-X N-A-XTRA STEELS

Quenched and tempered steels of excellent weldability and toughness, with yield strengths from 75,000 - 110,000 psi.

N-A-X HIGH MANGANESE STEELS

N-A-X High Manganese and High Manganese Special Killed. These steels give yield strengths up to 50,000 psi.

A series of fine grained mild carbon steels of unusually high strength, toughness and weldability

Metallurgical research has produced the new GLX-W Series of High-Strength steels. An exceptionally fine grain structure in this series makes possible the high strength, good notch toughness and excellent weldability of these steels. The series consists of GLX-45-W, GLX-50-W, GLX-55-W and GLX-60-W, based on minimum yield strengths of 45,000 psi up to 60,000 psi.

IMPORTANT MECHANICAL PROPERTIES OF GLX-W STEELS

STRENGTH—up to 60,000 psi yield strength with good ductility.

NOTCH TOUGHNESS—good notch toughness at normal and subnormal temperatures.

WELDABILITY—low carbon and manganese content assures freedom from underbead cracking under all conditions.

The combination of these properties, together with lowered material and manufacturing costs and simplified fabrication processes, indicates a wide range of applications for GLX-W steels.

For additional technical information about GLX-W steels, write

Product Development Division, Dept. B-8

GREAT LAKES STEEL CORPORATION

Detroit 29, Michigan

GLX-W

another new product developed by a division of

NATIONAL STEEL CORPORATION

There's no mistaking

SIMONDS

LOW CARBON

Flat Ground Steel

LOW CARBON LOW CARBON LOW CARBON LOW

← with this NEW Full-Length Labeling →

There's no confusion with other types of steel, when you use Simonds Low Carbon Flat Ground Steel. For this new product is readily identified by the full-length, peel-off tape. What's more, this modern labeling does not mar the bar . . . does not interfere with scribing . . . leaves no trace when removed.

This new low-cost steel completes the Simonds line . . . OIL and AIR Hardening Die Steels, and now LOW CARBON Flat Ground Steel as well. All three types are made to the same close tolerances, with the same extra smooth surface finish and good machinability.

Simonds Low Carbon Steel comes in flats from 1/16" to 1½" thick, and ½" to 16" wide; also in squares from ⅜" to 2⅞". All stock sizes come in standard, ready-to-use 24" lengths, individually packaged. Special sizes on order. Call your Simonds Distributor *now*.

For Fast Service from Complete Stocks Call your

SIMONDS Industrial Supply DISTRIBUTOR

SIMONDS SAW AND STEEL CO.

FITCHBURG, MASS.

Factory Branches in Boston, Chicago, Shreveport, La., San Francisco and Portland, Oregon
Canadian Factory in Montreal, Que., Simonds Divisions: Simonds Steel Mill, Lockport, N. Y.
Heller Tool Co., Newcomerstown, Ohio, Simonds Abrasive Co., Phila., Pa., and Arvida, Que., Canada

open motors for extreme conditions

Save up to 60%!

Here's an amazing advance in motor technology! It's the *Super-Seal* motor line — an open motor design so completely unaffected by moisture, dust, dirt, oil, acids and alkalis that it can be used in many applications previously requiring more costly enclosed motors. *Savings range from 15 to 60%.*

Super-Seal motor superiority results from revolutionary insulating techniques. Available in any integral horsepower size, smaller *Super-Seal* motors incorporate an encapsulated stator. A durable epoxy resin encloses the stator, creating an electrical system impervious to outside elements.

In larger sizes, *Silco-Flex* insulation is used. In this system, silicone rubber is vulcanized into a homogeneous mass to form a flexible, moisture and heat resistant, void-free dielectric barrier around coils and leads.

Both of these insulation systems are unsurpassed. Proof? An encapsulated motor ran for hundreds of hours at full load in a 4% brine solution.

Find out more about new economies in motors from your A-C representative or distributor, or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin. *Silco-Flex and Super-Seal are Allis-Chalmers trademarks.*

ALLIS-CHALMERS A-C ALLIS CHALMERS

A-5802

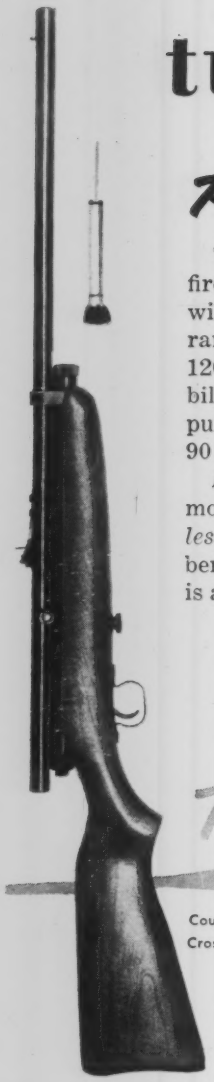
How 4 Frasse tubes

PUT "LEO" TO SLEEP

This newly developed "Cap-Chur" gun fires a dart-like, self injecting syringe with precise accuracy... has an effective range of 50 yards. The syringe travels at 1200 feet per minute—injects its immobilizing solution 5 seconds after firing... puts an animal to sleep in approximately 90 seconds.

Four types of tubing are used in this modern "blow gun". The barrel is a *seamless steel* tube... the compression chamber is a *welded steel* tube... the syringe is an *aluminum* tube... and the needle is a *stainless steel* tube. Yet, despite this mixed requirement, all four types are furnished by Frasse—with never a delivery delay or rejection since production began.

So, if you use tubing in your product—want trouble-free quality in a hurry... *it will pay to make Frasse your source for tubing.* Complete Frasse tubing stocks enable you to select the type and size best suited to your needs... and Frasse tubing specialists are always available to assist you with any problem involving a tubular product.



Courtesy:
Crosman Arms Co., Inc.

FRASSE... for Tubing

Seamless and Welded Mechanical Tubing
Pressure and Hydraulic Tubes
Centrifugally Spun Tubing
Stainless Tubing, Seamless and Welded
Stainless Pipe, Valves and Fittings
Aluminum Tubing, Holobar, Pipe and Fittings
PVC Plastic Pipe, Valves and Fittings

Peter A. Frasse & Co., Inc.

AMERICAN STEEL WAREHOUSE ASS'N
YOUR STEEL SERVICE CENTER

NEW YORK 13, N. Y.
17 Grand St.
WAlker 5-2200

PHILADELPHIA 29, PA.
3911 Wissahickon Ave.
BAldwin 9-9900

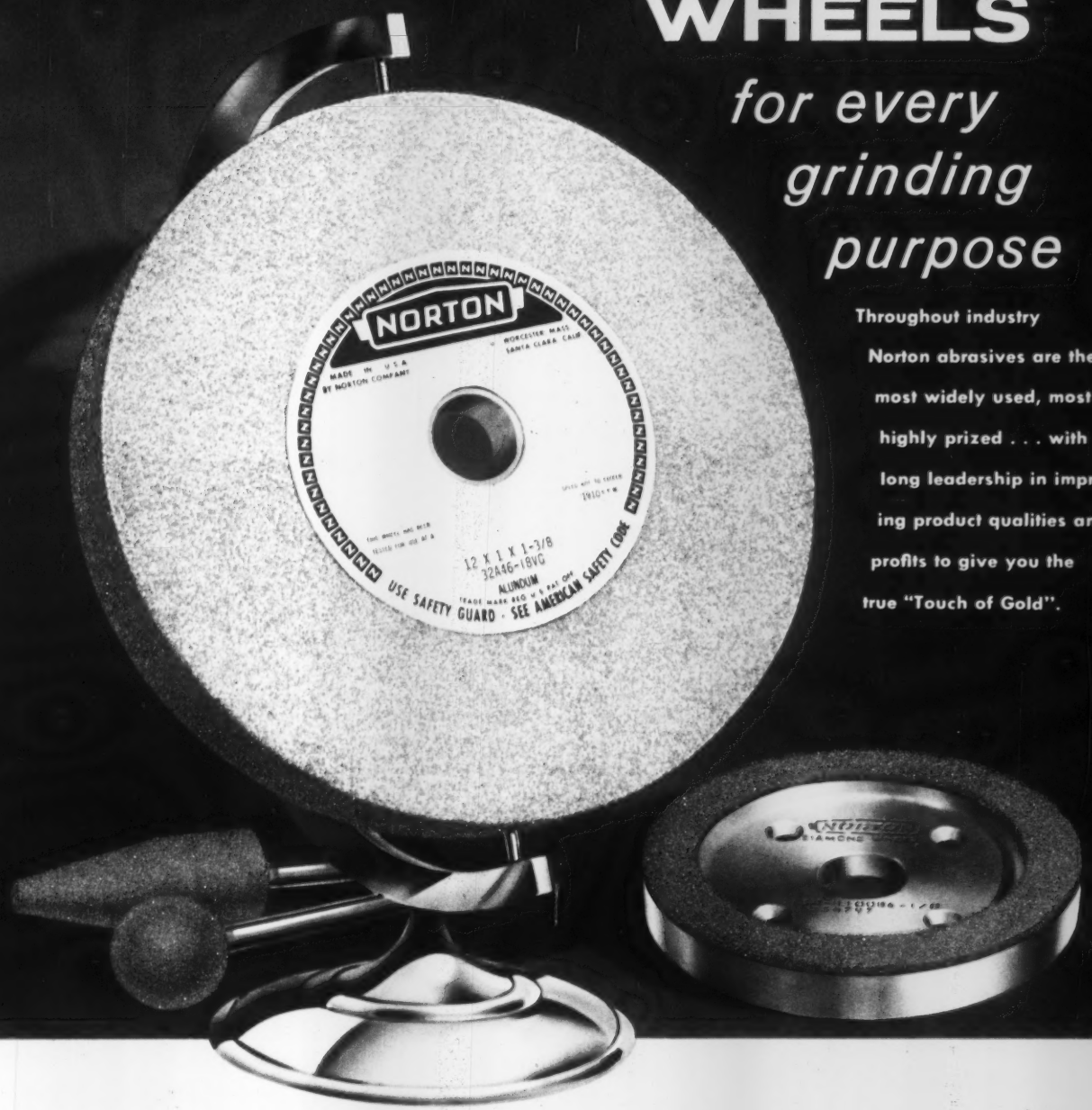
BUFFALO 7, N. Y.
P. O. Box K, Sta. B
BEdford 4700

SYRACUSE 1, N. Y.
P. O. Box 1267
HOward 3-8655

HARTFORD 1, CONN.
P. O. Box 1949
JAckson 9-6861

LYNDHURST, N. J. • ROCHESTER, N. Y.

First in the WORLD OF WHEELS *for every grinding purpose*



Throughout industry Norton abrasives are the most widely used, most highly prized . . . with long leadership in improving product qualities and profits to give you the true "Touch of Gold".

Around the world and still expanding

Abrasive and Grinding Wheel Plants — Worcester, Mass.; Santa Clara, Calif.; Hamilton, Ontario; South Africa; England; France; Germany; Italy; Brazil.

Behr-Manning Plants — *Coated Abrasives and Pressure-Sensitive Tapes* — Troy, N.Y.; Canada; Australia; France; Northern Ireland; Argentina; Brazil.

Electric Furnace Plants — Huntsville, Alabama; Chippawa, Ontario; Cap-de-la-Madeleine, Quebec; Brazil.

Grinding and Lapping Machine Plant — Worcester, Mass.

Refractories Plant — Worcester, Mass.

Electro-Chemical Plants — Chippawa, Ontario; Huntsville, Alabama.

Norton Pike Plant — *Sharpening Stones* — *Stair and Floor Tile* — Littleton, New Hampshire.

Bauxite Mines — Bauxite, Arkansas.

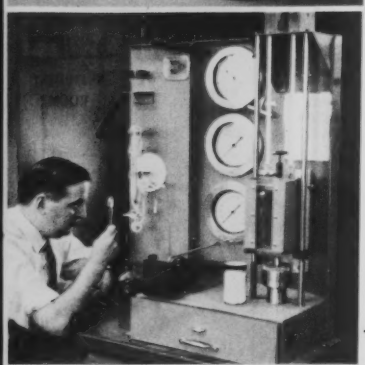
General Offices: Norton Company, Worcester, Mass.

Headquarters for the "TOUCH of GOLD"

The world's largest source of abrasive research, manufacturing development, and service . . . all combining to aid your own production with improved grinding at lower cost.

BIG STEPS FORWARD Some of the latest and most important Norton developments—from top to bottom: a 32 ALUNDUM G-bond wheel, providing a unique aluminum oxide abrasive of outstanding performance plus the most advanced vitrified bond ever developed for precision, and semi-precision grinding . . . ALUNDUM TUMBLEX "S" bonded spheres for barrel finishing—spheres that get into areas where other shapes can't reach . . . A 44 ALUNDUM wheel, the most sensational non-premium abrasive ever developed for economical grinding — both rough and precision. Advancements like these are typical of the more than 200,000 different types and sizes of Norton abrasive products that cover every modern grinding job.

SELECTION IN ACTION For ordinary grinding jobs the vast amount of Norton know-how literature tells you how to select exactly the right wheels, while the many Norton films show the best grinding methods. But you may have new, unusual problems. Then, your distributor's Norton factory-trained specialist by studying your jobs can help you find the right solutions in quick time. And if necessary, he'll call in your regional Norton Abrasive Engineer for additional technical advice. With experts like these, the grinding wheels you need will be proved in action—on your machines.



DISCOVERING MUCH MORE Norton laboratory researchers, numbering over 180 scientists and technicians, are constantly seeking to find out a great deal more about abrasives and grinding wheels. Their chief interest is in developing new abrasives, new abrasive products and improved grinding techniques. Their many successes in research of this nature have stepped up grinding progress to lower your grinding costs.

THE RIGHT WHEELS ARE RIGHT AT HAND Your Norton distributor is careful to keep his stocks fully adequate to meet all needs of his area. That's true, too, of the stocks in the five big, strategically located Norton branch warehouses — in the Norton California plant — and of the gigantic stocks at Worcester in "Norton City" — the world's largest grinding wheel plant, Headquarters of the "Touch of Gold."

NORTON ABRASIVES

Making better products . . . to make your products better

NORTON COMPANY • WORCESTER, MASS.

District Offices: Chicago* • Cleveland* • Detroit* • Hartford • Los Angeles Area (Huntington Park) • New York Area (Teterboro, N.J.) • Philadelphia* • Pittsburgh* • St. Louis

**Warehouse Facilities and Stocks at this location*

Plants and distributors around the world

BEHR-MANNING CO., Troy, N.Y. is a division of Norton Company

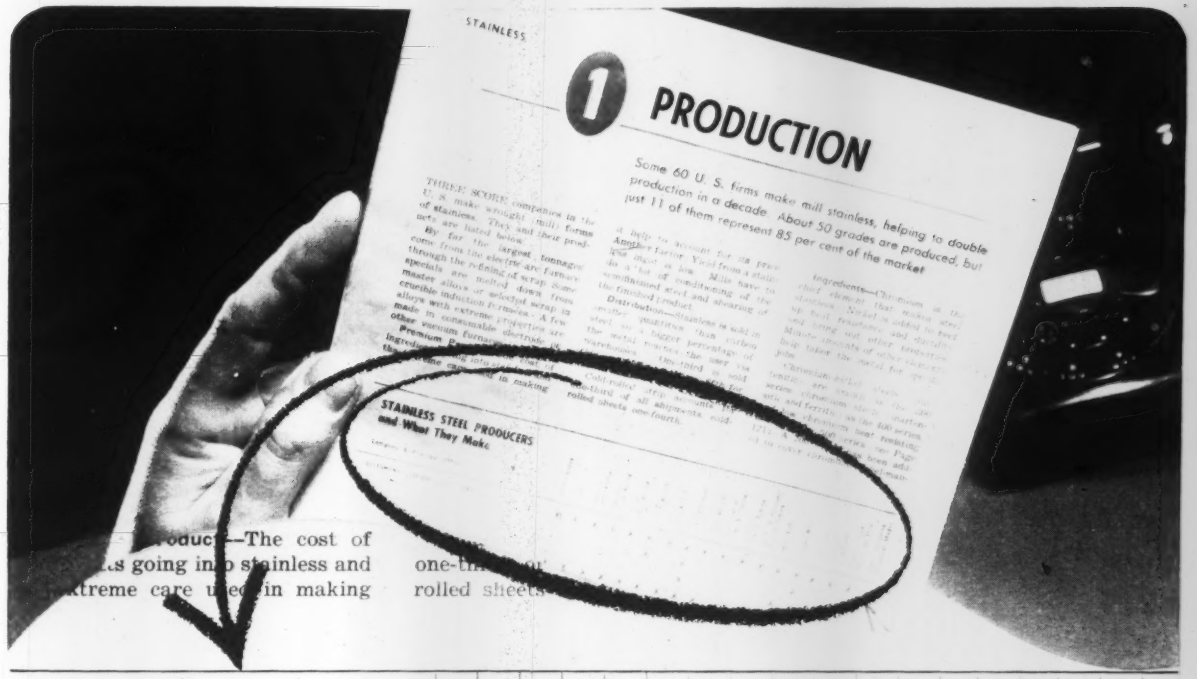
NORTON PRODUCTS

Abrasives • Grinding Wheels
Grinding Machines • Refractories
Electrochemicals

BEHR-MANNING DIVISION

Coated Abrasives • Sharpening Stones
Pressure-Sensitive Tapes

4-58



STAINLESS STEEL PRODUCERS and What They Make

Company & Principal Office	Semifinished	Plates	Sheets, Hot Rolled	Sheets, Cold Rolled	Strip, Hot Rolled	Strip, Cold Rolled	Bars, Hot Rolled	Bars, Cold Finished	Tube Rounds	Electricweld Pipe & Tubing	Seamless Pipe & Tubing	Mech. & Pressure Pipe & Tubing	Wire Rods	Drawn Wire	Extrusions	Stainless Clad Plates	Stainless Clad Sheets or Strip	Other, Including Structural Shapes
ALLEGHENY LUDLUM STEEL CORP. Pittsburgh	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
						X		X						X				

Of the 60 producers of stainless steel...

only ALLEGHENY LUDLUM makes all sizes, shapes, finishes and analyses

In its November 4, 1957 issue, STEEL magazine published a complete run-down on the stainless steel industry. This article reveals that *only Allegheny Ludlum*, of the 60 some companies making stainless, produces all sizes, shapes, finishes and analyses.

This can save you considerable time and money. When you make Allegheny Ludlum your *one* source of stainless, you work with *one* sales engineer—*one* order, whether you buy sheet, strip, bars, tubing or whatever.

And, at the same time, you get the best technical service. A-L's crack research and development department is continually searching for new alloys, and better ways to use today's. Its findings are freely available to you through sales engineers, technicians and special literature.

Allegheny Ludlum follows the product from the melt through to finished form, has greater quality control over the stainless you buy. And since A-L makes all forms of stainless, you get unbiased recommendations as to what is best for your individual needs.

Profit by Allegheny Ludlum's status as the only one-source integrated supplier of all stainless forms. Call your A-L representative today . . . see how he can save you money and time. Or write *Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pa.*

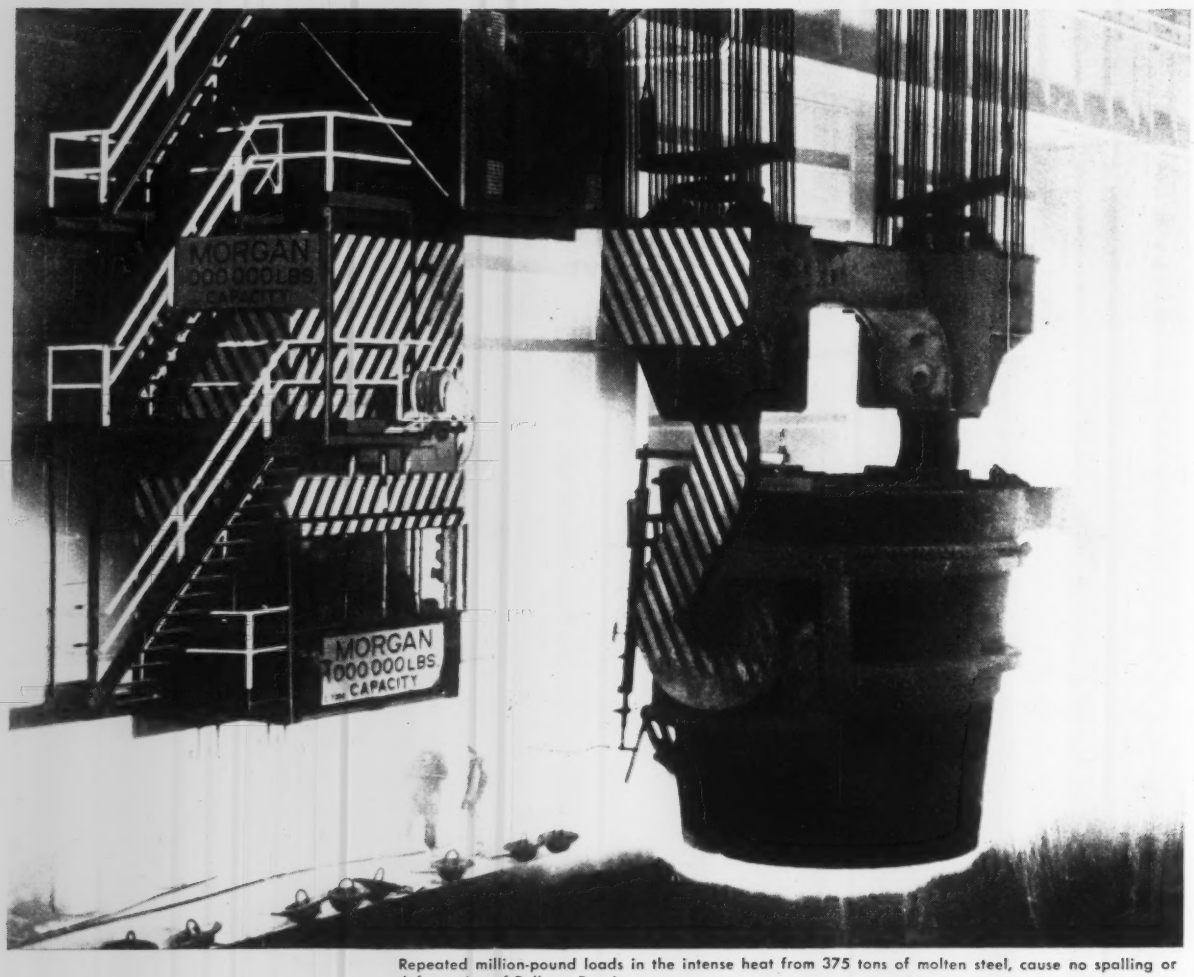
WSW 7121

ALLEGHENY LUDLUM

for warehouse delivery of Allegheny Stainless, call RYERSON

Export distribution: AIRCO INTERNATIONAL

EVERY FORM OF STAINLESS . . . EVERY HELP IN USING IT



Repeated million-pound loads in the intense heat from 375 tons of molten steel, cause no spalling or deformation of Rollway Bearings.

1,122,000 Pounds Ride on 68 Rollway Bearings

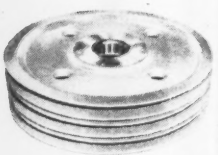
One of the largest in the world, this 500-ton Morgan-built ladle crane is Rollway equipped in many positions.

Sixty-eight maximum-type, solid-cylindrical bearings—mounted without inner races—lift and lower the 1,122,000-pound weight of the lifting beam, ladle hooks, ladle and white-hot steel.

Rollway Tru-Rol® type bearings are used in the two General Electric 360 HP – MD-620 Hoist motors which lift the weight of the ladle and its molten metal content.

The maximum-type bearings in the hoisting sheaves are mounted directly on the shaft without inner races, which greatly simplifies assembly for applications of this size.

Thrust bearings in the 25-ton and 75-ton auxiliary crane hooks are standard Rollway precision types with broad-area contact between rollers and plates to prevent Brinelling and assure freedom of rotation under the heaviest loads.



Sheaves ready for assembly on shaft and installation in lifting beam.

For bearings that accomplish the extraordinary in an ordinary manner, write, wire or 'phone Rollway Bearing Co., Syracuse 1, N.Y.

ROLLWAY® BEARINGS

ENGINEERING OFFICES: Syracuse • Boston • Chicago • Detroit • Toronto • Pittsburgh • Cleveland • Seattle • Houston • Philadelphia • Los Angeles • San Francisco

A NEW PICKLE LINE IN ONLY 6½ MONTHS?

This line delivered in 202 days from date of order . . . another example of how you get what you need from PM PRODUCTIONEERING*

On March 6 Production Machinery received an order for a continuous pickle line to be installed in an Ohio steel mill. By September 23 the order was shipped complete.

Usually it takes 12 months or more to deliver this type of line.

*PM Productioneering** hit this time target because *speed* was desired by the mill — quick completion would help get the whole 11 million dollar cold strip mill into operation, and earning its keep.

Even more important to the mill were engineering advances which *PM Productioneering* offered — improved product quality, increased production, and reduced maintenance.

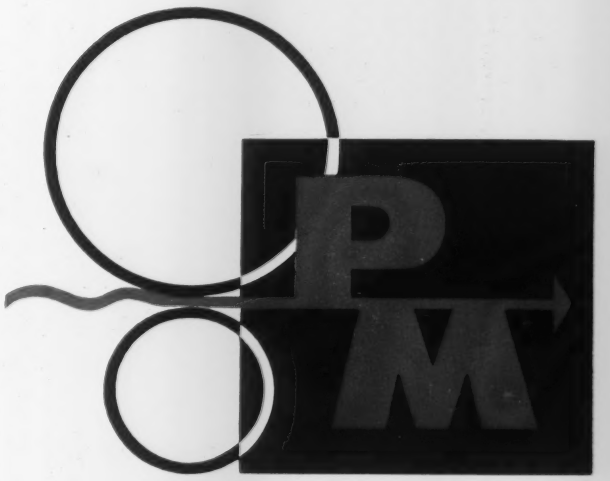
Find out how *PM Productioneering* can offer you advantages, when you install any of the equipment listed at left. Call in a PM man — there's no obligation.

Production Machinery Corporation
Mentor, Ohio

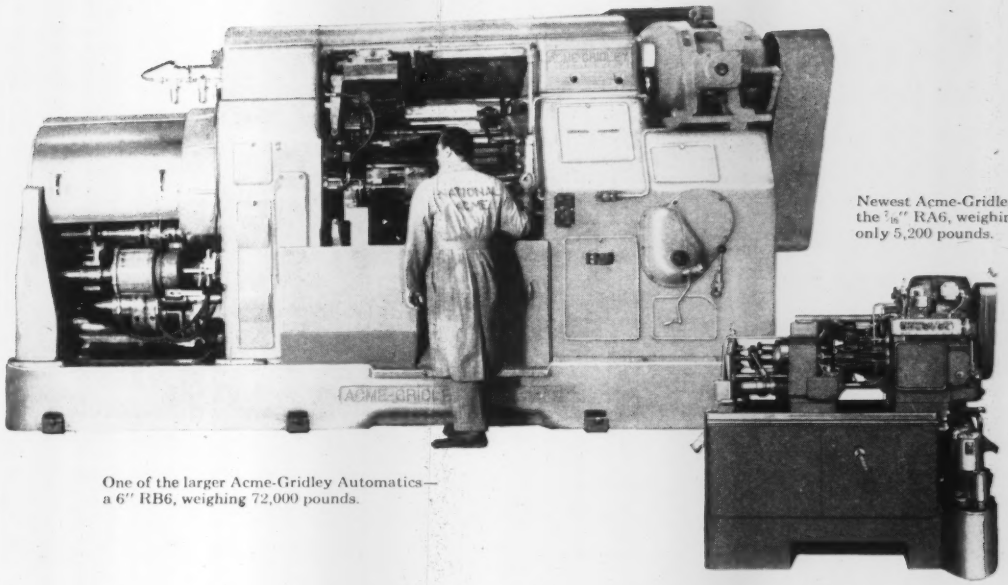
P/M PROCESSING EQUIPMENT INCLUDES:

- Vacuum Handling Equipment
- Slitting Lines
- Slit Coil Banding Equipment
- Shearing and Cut-to-Length Lines
- Grinding and Scouring Lines
- Coil Build-up and Inspection Lines
- Continuous Lines for Annealing, Coating, Grit Blast Cleaning, Leveling and Miscellaneous Sheet and Strip Processing.

*** PRODUCTIONEERING is the P/M way of working so engineers who supervise equipment designing have first-hand knowledge of problems encountered by sheet and strip processing line users. In working with P/M you work with responsible engineers who apply their skill to solve your problems.**



Produce parts like these on



Newest Acme-Gridley—the $\frac{3}{16}$" RA6, weighing only 5,200 pounds.

One of the larger Acme-Gridley Automatics—a 6" RB6, weighing 72,000 pounds.

ACME-GRIDLEY automatics . . .

FORGET SECONDARY OPERATIONS!

Most parts machined on Acme-Gridleys are *completed* on Acme-Gridleys. Using these Automatics, you eliminate costly rehandling and, in many instances, avoid a sizeable second-machine investment.

The advantage applies to parts weighing fractions of ounces or hundreds of pounds. And the wide-open tooling zone of every Acme-Gridley lends itself to a broad range of installations limited only by the tool engineer's ingenuity. It means that, for sheer capacity range, no line of automatic production equipment in the world equals Acme-Gridley.

If you produce parts like the ones illustrated, then Acme-Gridley Automatics must be in your present plans. Our representative can give you expert assistance without obligation.

National Acme

THE NATIONAL ACME COMPANY, 189 E. 131st ST., CLEVELAND 8, OHIO • Sales Offices: Newark 2, N.J., Chicago 6, Ill., Detroit 27, Mich.

call KE for plant expansion or new facilities

INGENUITY

has made KE a major engineer-contractor serving Minerals

Design of a concentrating plant to process 60,000 tons of iron ore per day. Open pit bauxite facilities. Coking coal processing plants. Diatomite plants. Cement plants. These are a few of many projects and studies Kaiser Engineers undertakes for the Minerals industries in the United States and world-wide—Quebec, Jamaica, Mexico, Brazil, Australia, New Zealand, Greece, Turkey, India.

From determination of process through design and construction of complete facilities, KE can perform any or all steps. And perform them with Ingenuity—to produce a more efficient operation, in less time, at lower cost.

For your next facility—whether ferrous, non-ferrous or non-metallic—call KE.

Pendulum ore conveyor—Ingenuity produced KE innovation distributing beneficiated iron ore in 180° crescent: conserved space, cut rehandling costs.

KAISER ENGINEERS

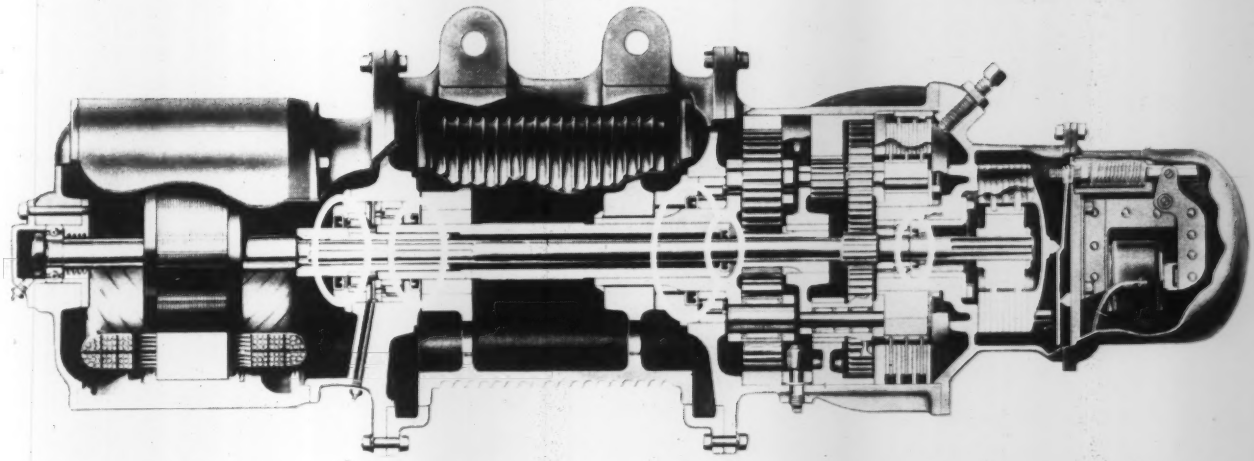
KAISER ENGINEERS

engineers-contractors
Contracting since 1914

Division of Henry J. Kaiser Company · Oakland 12, California · New York, Pittsburgh, Washington, D. C., Buenos Aires, Calcutta, Dusseldorf, Montreal, Rio de Janeiro, Sydney, Tokyo

4630

MORE ABOUT THE GARLOCK 2,000



General-purpose KLOZURE Oil Seals (Model 63 cutaway right) afford complete protection at important bearing locations (circled above) on the Shepard-Niles "Liftabout" Hoist.

Garlock Klozure* Oil Seals

assure durable, dependable performance on tough sealing jobs

Friction and bearing wear, hazardous to any industry, are especially harmful in materials handling. That's why Shepard-Niles and other leading crane and hoist manufacturers specify Garlock KLOZURE Oil Seals for complete bearing protection. Shepard-Niles "Liftabout" is typical of how Garlock KLOZURES not only exclude dust and foreign matter from bearings but also retain the important lubrication—both of which add to greater dependability during rugged hoist operation.

Designing Garlock KLOZURES into your equipment protects bearings with oil seals that are durable, economical, and easy to replace. Garlock KLOZURES can be applied on low, medium, or high speed service. Whether your application is general-purpose in nature, or there's a specific job to be done, Garlock has a KLOZURE design for you.

KLOZURES are another of the Garlock 2,000 . . . two thousand types of packings, gaskets, and seals for every need. The only complete line. It's one reason you get unbiased recommendations from your Garlock representative.

Call him or write for KLOZURE Catalog 20.

*Registered Trademark

THE GARLOCK PACKING COMPANY, Palmyra, N. Y.
For Prompt Service, contact one of our 30 sales offices and warehouses throughout the U.S. and Canada.

GARLOCK

Packings, Gaskets, Oil Seals, Mechanical Seals, Molded and Extruded Rubber, Plastic Products.

There's an AJAX FORGING MACHINE . . .

— For Every Field of Upset Forging in Industry —

BUILT IN TWELVE SIZES 1″ to 12″

Choose from a complete line of AJAX Forging Machines to make the forged parts you need—

AUTOMOTIVE — Transmission Gears — Flanged Axle Shafts — Crankshaft Flanges & Drag Links

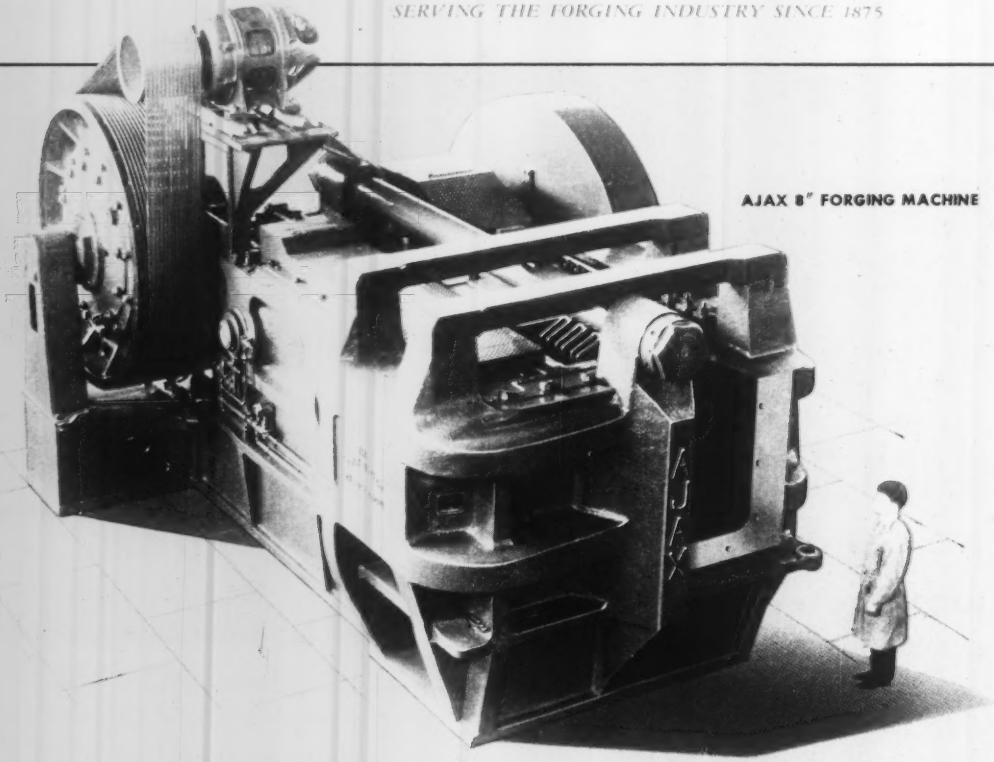
AIRCRAFT — Cylinder Heads & Jet Blade Blanks

AGRICULTURAL — Implement & Tractor Forgings

RAILROAD — Freight Car Brake Levers — Grab Irons & Brackets

For Higher Production and more accurately Forged Parts — Specify AJAX Forging Machinery

SERVING THE FORGING INDUSTRY SINCE 1875



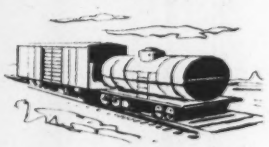
AJAX 8″ FORGING MACHINE

AIRCRAFT

AGRICULTURE

AUTOMOTIVE

RAILROAD



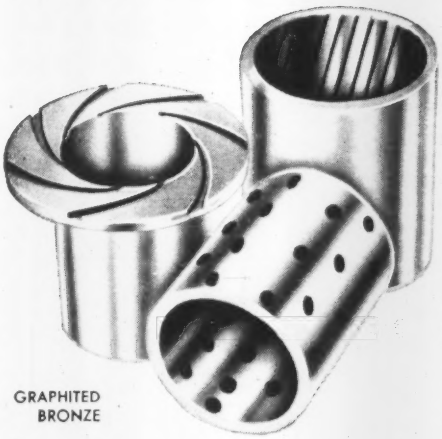
AJAX METAL WORKING MACHINES

FORGING PRESSES — FORGING MACHINES — FORGING ROLLS — AJAX-HOGUE WIRE DRAWERS

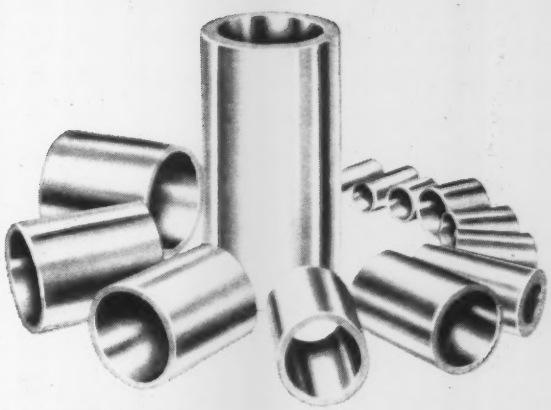
THE AJAX MANUFACTURING COMPANY . . . . . CLEVELAND 17, OHIO

CHICAGO OFFICE: 110 S. DEARBORN ST., CHICAGO 3, ILLINOIS

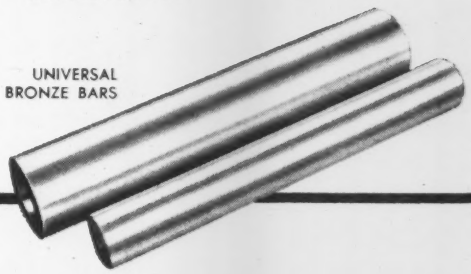
W. P. WOOLDRIDGE CO. · BURLINGAME, CAL. · LOS ANGELES 22, CAL.



GRAPHITED BRONZE

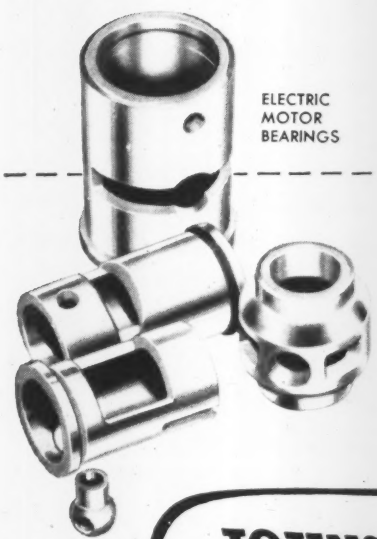


GENERAL PURPOSE



UNIVERSAL BRONZE BARS

LEDALOYL SELF-LUBRICATING



ELECTRIC MOTOR BEARINGS

Over 2300 types and sizes of bearings and bars in stock

Johnson Bronze can supply over 1900 sizes and types of sleeve bearings, and over 400 sizes of bronze bars from stock. This includes standard stock GP bearings, graphited bearings, Ledaloyl self-lubricating bearings, and electric motor bearings made to motor specifications. You can select an economical standard bearing for almost any application from this large stock. For complete details on how Johnson Bronze stock bearings can save you money, contact your Johnson distributor.

JOHNSON Bearings

Johnson Bronze

550 South Mill Street • New Castle, Pa.

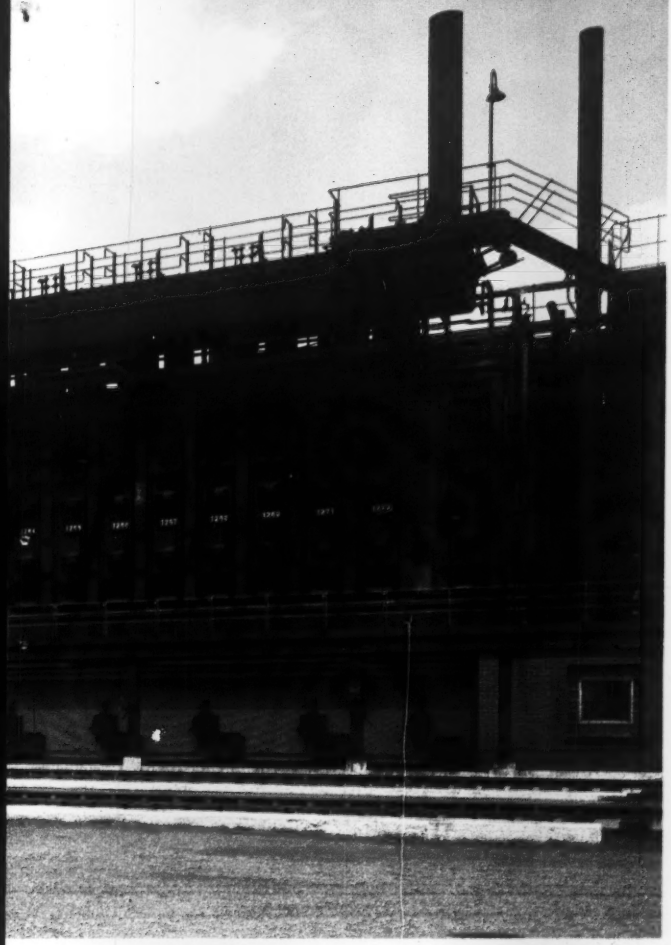
Subsidiary: Apex Bronze Foundry Co., Oakland, Cal.

Eastern steel plant now has

65 NEW OVENS—These new ovens were furnished by Koppers, and were put into operation in June, 1957.

COAL HANDLING SYSTEM FOR THE COKE PLANT—Coal is conveyed to the breaker and balance building (center foreground), to the mixer and hammermill building, to the junction house (between stacks), and finally to the coal bin over the ovens.

12 coke oven batteries, 758 ovens . . .
ALL designed and built by Koppers



SEVEN 385-TON OPEN-HEARTH FURNACES were designed by Koppers for this giant plant.

A giant Eastern Steel Plant recently put into operation a new battery of 65 Koppers-Becker Underjet Coke Ovens. This coke oven battery is the twelfth at this plant—*all designed and built by Koppers.* This battery is designed for underfiring with either blast furnace or coke oven gas. It has a daily coal carbonizing capacity of 1,450 net tons, and gives the plant a total carbonizing capacity in excess of 15,000 tons per day. To help supply the expanded coke plant, a new coal handling system was designed and installed by Koppers.

At this same plant, Koppers contributed further to the expansion of facilities by designing and supervising construction of a new open-hearth shop, and the installation of soaking pits and a 45″ by 90″ Universal slabbing mill.

Repeat Orders Signify Satisfied Customers. Since 1907 Koppers engineers have been working with coke ovens: reducing operating costs . . . increasing yield of chemicals . . . improving heating control. Koppers has built the majority of coke ovens in the United States. Most of this business, like the 12 batteries built for this Eastern Plant, has been repeat business—the kind you get only if your product has given satisfactory service.

Koppers coke plant layouts are engineered to fit individual requirements and to solve all coke plant problems dealing with coal preparation and handling, coal-chemical recovery, light oil purification and refining, phenol recovery, and associated processes. Koppers also welcomes repair and replacement work for coke ovens and auxiliaries.

If you want help or advice with any steel-plant expansion program, call on Koppers.

KOPPERS®

50 YEARS OF ENGINEERING AND CONSTRUCTION SERVICE
1908···1958

KOPPERS

Versatile ACIPCO SPUN TUBES

Stainless steel, carbon steel, alloy iron or special analyses—versatile ACIPCO tubes are "custom-spun" to the exact physical, chemical and metallurgical specifications required by design, manufacturing and end-use conditions.

Because they are centrifugally spun, the metal grain structure of ACIPCO tubes is dense, non-directional and porosity-free. This *superior* grain structure not only makes ACIPCO tubes easier to machine to close tolerances, but also results in greater strength and durability. In addition, the inherent dimensional stability and concentricity of ACIPCO tubes make dynamic balance easier to attain in finished products.

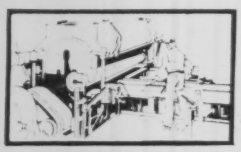
ACIPCO's complete, integrated facilities for casting, heat-treating, machining, fabricating and testing offer the additional advantages of "one source—from start to finish" service.

Call or write today for information about ACIPCO tube applications in your field, or for expert technical assistance on your specific tubular metal problem.

SIZE RANGE: Lengths up to 410" have been produced to meet modern machinery requirements. OD's from 2.25" to 50"; wall thicknesses from .25" to 4".

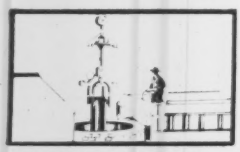
ANALYSES: All alloy grades in steel and cast iron, including heat and corrosion resistant stainless steel, plain carbon steel and special analyses.

FINISHED: As cast, rough machined, or finished machined, including honing. Complete welding and machine shop facilities for fabrication.



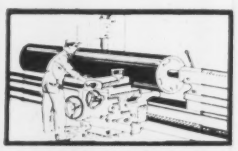
SPINNING

ACIPCO tubes are centrifugally spun to exact physical and metallurgical specifications. Thus, the exact size and metal analysis your process or project requires is assured.



HEAT TREATING

Modern equipment for uniform, controlled heat treating and quenching is an ACIPCO advantage for users of steel tubes where specific physical, mechanical and other metal properties are required.



MACHINING

ACIPCO'S machine shop, one of the South's most completely equipped, performs a full range of machine shop operations including turning, boring, drilling, facing, grinding, metallizing, polishing and honing.

FABRICATION

Complete, integrated facilities for machining, welding, finishing and heat treating of tubular parts save time and expense for ACIPCO customers.

TECHNICAL ASSISTANCE

A staff of highly trained engineers, metallurgists, chemists, and craftsmen is available to designers and manufacturers who specify ACIPCO spun tubes.

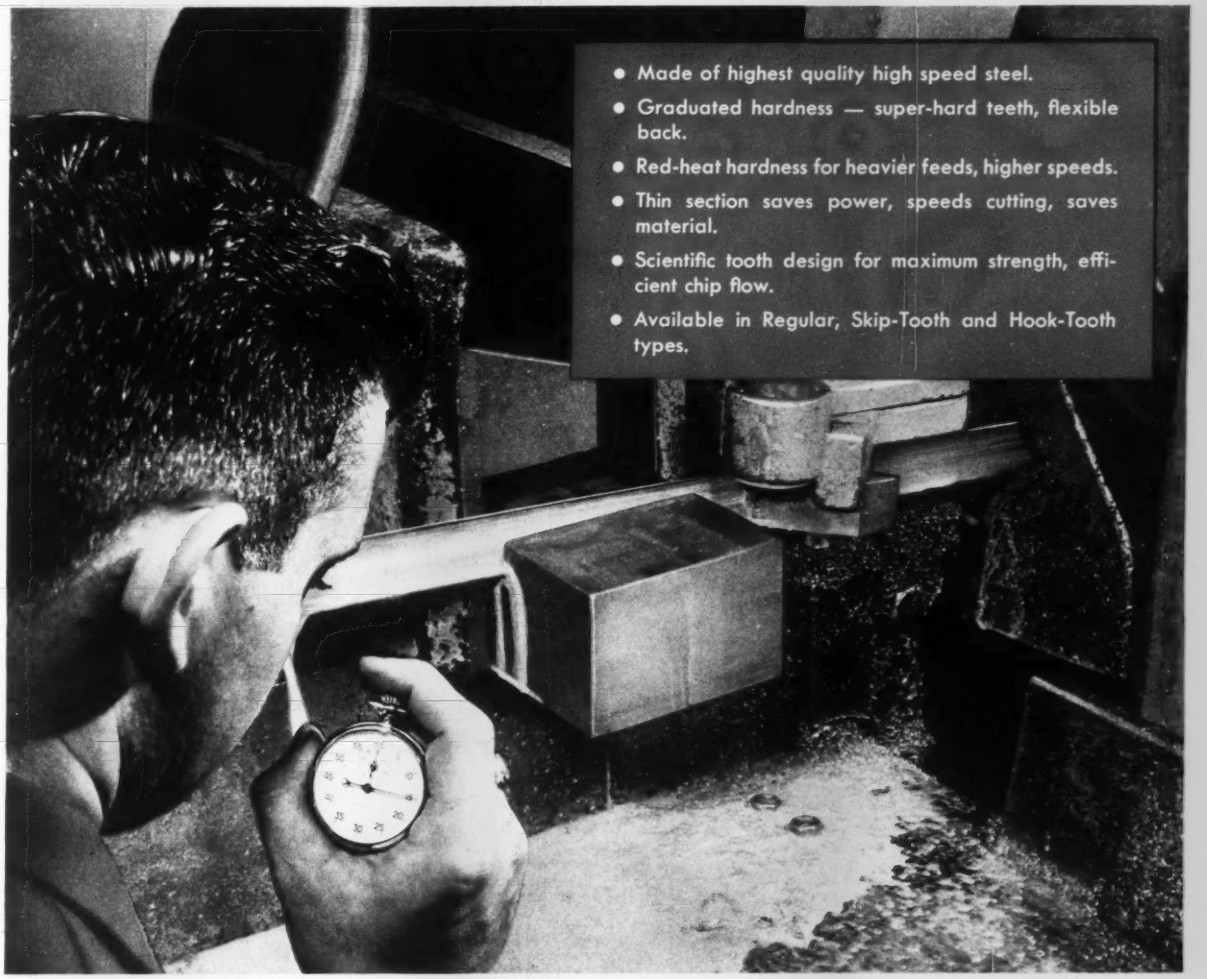
Special Products Division

MERICAN

CAST IRON PIPE CO.

PHONE AL 1-8121, EXT. 285 • BIRMINGHAM, ALA.

STARRETT PRECISION MAKES GOOD PRODUCTS BETTER



STARRETT SAFE-FLEX® HIGH SPEED STEEL BAND SAW

Cuts up to 10 times faster; Outlasts ordinary blades 10 to 1

Engineered for production cutting with higher speeds and heavier feeds, this new Starrett *high speed steel* band saw pays for itself over and over in substantially lower cutting costs, longer tool life and important material savings. Shop experience shows it consistently cuts up to 10 times faster, outlasts ordinary blades as much as 30 to 1.

Graduated hardness gives it super-hard teeth and a super-tough back while red-heat hardness, even at temperatures up to 1100° F. keeps this new band hard and sharp. Thinner section (.025″ to .042″) lets it cut faster with less power and less chip loss.

Your nearby Industrial Supply Distributor stocks this new Starrett SAFE-FLEX® *High Speed Steel* Band Saw in regular, skip-tooth and hook-tooth types. Call him for quality products, dependable service — or write for complete information. Address Dept. BG, The L. S. Starrett Company, Athol, Massachusetts, U. S. A.

Starrett®

PRODUCTION-PROVED BAND SAWS

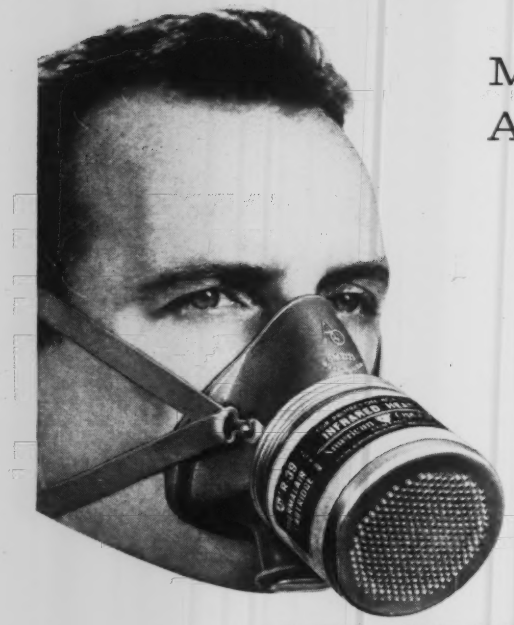
World's Greatest Toolmakers

STARRETT TOOLS

PRECISION TOOLS • DIAL INDICATORS • STEEL TAPES • GROUND FLAT STOCK • HACKSAWS • HOLE SAWS • BAND SAWS • BAND KNIVES

Visit the Starrett Exhibit — Booth 2546, National Metal Show

NEW...AO Introduces "THERMALAIR"*



More than a NEW Respirator – A New IDEA in Respirators!

For Protection Against Excessive Heat meet the R-2039 Thermalair Respirator — newest in the line. It's equipped with a new R-39 heat exchanger cartridge to permit work in atmospheres considered too hot for endurance beyond a few seconds! Worker breathes in and heat is stored in the cartridge. Worker breathes out and the heat is removed from the cartridge. Reduces temperature of inhaled air to approximately 100°F. The Thermalair has already proved its capabilities on the job in many plants by reducing costly shut-down time for kilns and its performance in other hot atmospheres up to 300°F.

AO ALUMINIZED ASBESTOS CLOTHING

– for those Extra Hot Operations

These garments reflect 90% of radiant heat — weigh 50% less than regular asbestos — lower worker fatigue — increase efficiency.

7X243 Boots. Insulated against heat with aluminized asbestos as outside cover, fiber glass batting and flame resistant, duck inner lining. Oak tanned leather sole with fiber glass insulation, plus Silvabestos inner sole.

205RA Pants. All seams double stitched for extra strength. Snap fasteners at front opening. Leather belt loops. Duck lined waist band. Trousers 24″ at bottom. Standard leg length 32″ inseam. Standard waist sizes 30″ to 52″ in graduations of 2″. (Allow 2″ over regular waist measurements.)

204RA Coat. Complete protection for upper body. Wool collar protects neck. Snap fastener adjustment on cuffs assures snug fit. All snap fasteners on front have leather pull tabs for quick removal. All seams double stitched. Coats available in following standard lengths:

Cat. No.	Length
204RA-30	30″
204RA-36	36″
204RA-40	40″
204RA-44	44″
204RA-48	48″
204RA-50	50″

75RA Respirator Hood. Has *aluminized* window and accommodates *new* Thermalair Respirator for protecting head, eyes, face and lungs against excessive heat. Aluminized asbestos.

5X357 Heat Glove. Fully lined with leather palm for handling hot objects and aluminized asbestos back for reflecting heat.

Information on any of the above items will be gladly sent at your request.

*Pat. Applied For

Always insist on Ⓐ Trademarked Safety Products

American Optical COMPANY
SAFETY PRODUCTS DIVISION

SOUTHBRIDGE, MASS.
Safety Service Centers in Principal Cities

1833-1958 • 125 LEADERSHIP YEARS

FINE PATTERN on 11" diameter "plunger" forms molding surface for press to make abrasive wheels. The Carborundum Company.

Airkool-S retains precise size and shape through heat treatment

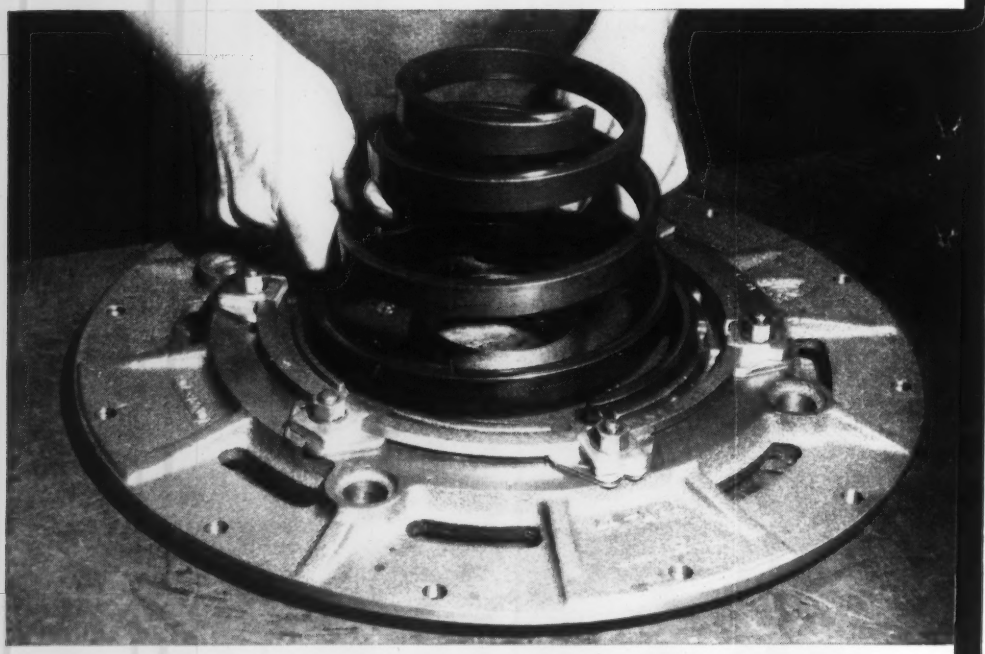
Forming this precise pattern is easily accomplished with Airkool-S, a tough, sulphur-bearing, air-hardening tool and die steel with good machinability. Its excellent nondeforming properties are important too, because this pattern must be retained, without distortion, through heat treatment.

Because Crucible Airkool-S is consistently uniform and clean, no objectionable irregularities appear on this fine pattern. Furthermore, Airkool-S is much more abrasion resistant than typical oil-hardening tool steels, and is substantially tougher than high-carbon, high-chromium types.

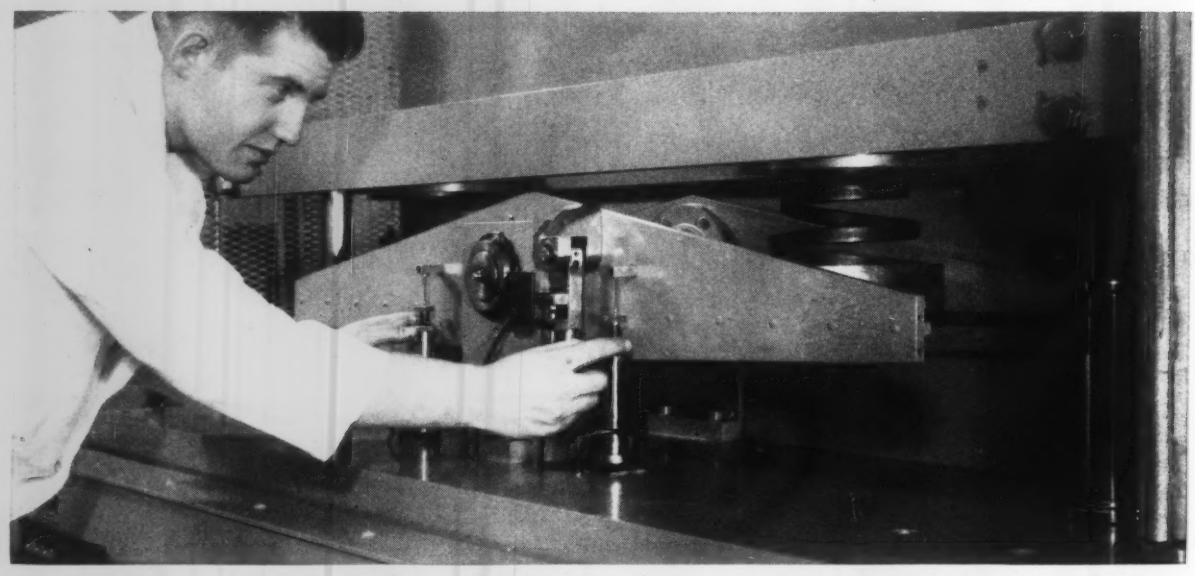
Stocks of Airkool-S and dozens of other special tool steels are maintained in all Crucible warehouses—in a wide range of sizes. *Crucible Steel Company of America, Dept. TJ15, The Oliver Building, Mellon Square, Pittsburgh 22, Pennsylvania.*

CRUCIBLE STEEL COMPANY OF AMERICA

Canadian Distributor—Railway & Power Engineering Corp., Ltd.



USS American Springs give longer life,



In the AS&W Spring Laboratory a semi-resonant spring fatigue machine is testing the Lipe-Rollway clutch spring. At speeds of 700 cpm this spring is functioned beyond its normal life span and at higher than normal stresses to prove conclusively its superior design as a clutch spring.

A USS American flat wire compression spring is shown in place in the Lipe-Rollway clutch. Four round wire compression springs are also being installed in the clutch.

better performance in heavy-duty clutches

...thanks to AS&W Spring Engineering Research Service

The Lipe-Rollway Clutch Division, Lipe-Rollway Corporation, Syracuse, N. Y., manufactures automotive clutches for heavy-duty trucks, tractors, buses and other large mobile equipment. Because USS American Springs play a vital part in the performance of these clutches, Lipe-Rollway asked the AS&W Spring Engineering Research Service to test the springs and determine if any changes should be made in the design to improve and maintain the high performance standards.

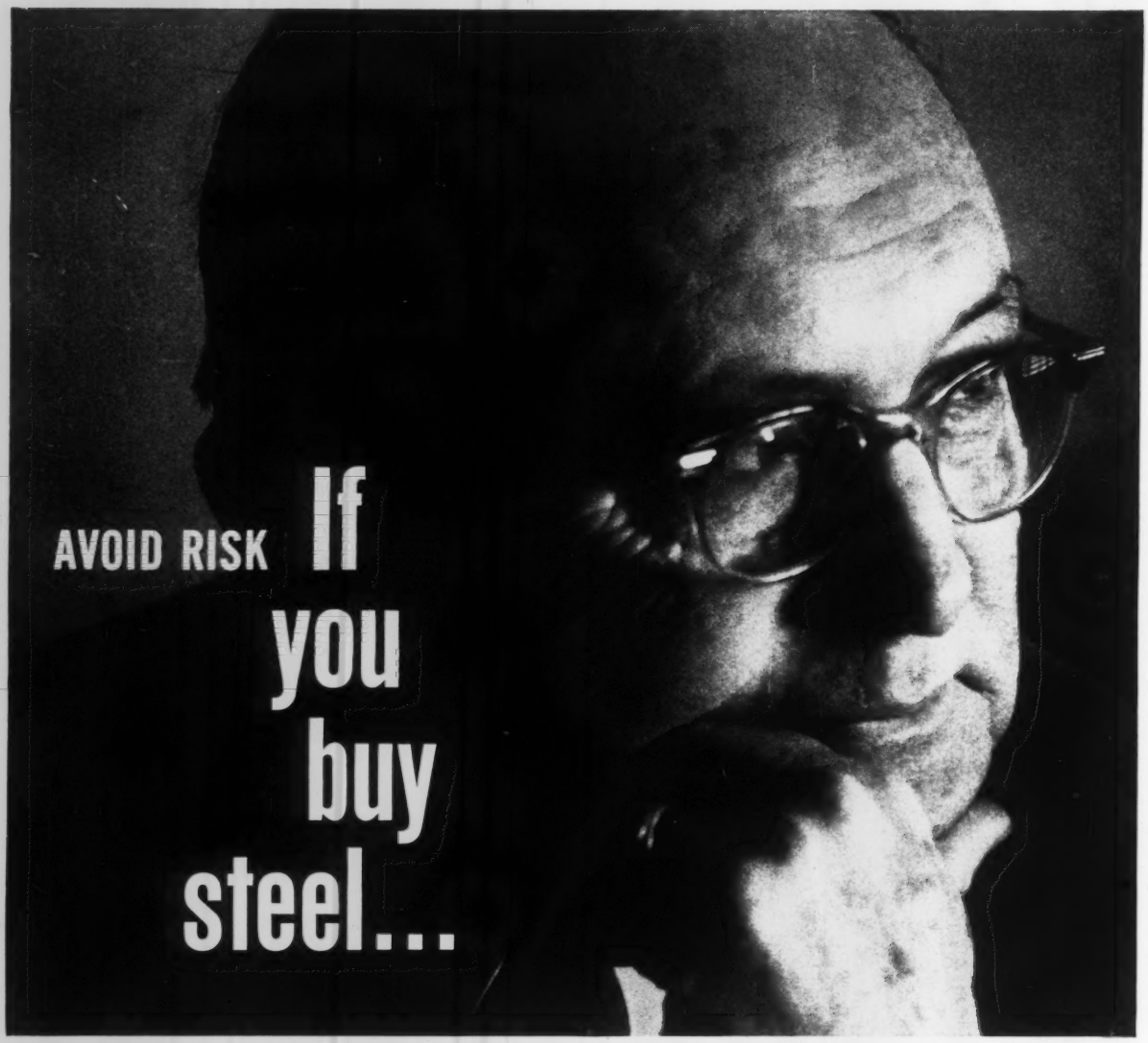
As a result of these tests the AS&W Engineers recommended certain important changes to give the springs longer life. After this recommendation was adopted by Lipe-Rollway, Mr. Harvey Gray, Chief Inspector & Quality Control, had this to say: "Exceptional service has been realized from our American Steel & Wire Springs."

If you have a spring problem or would like advice on the use of springs in your product, get in touch with our general office in Cleveland, or any American Steel & Wire Sales Office. You can benefit from the knowledge of AS&W's Spring Engineering Research Service. The Service has been engaged in laboratory experiments of static and dynamic testing for 20 years and has accumulated invaluable data on stress and fatigue life of steel springs, while endeavoring to improve efficiency in the use of steels—from steel chemistry through product application—to more economically cope with today's rigorous demands. This accumulated knowledge of the AS&W Spring Engineering Research Service is at your disposal.

American Steel & Wire Division, General Offices: Rockefeller Bldg., Cleveland 13, Ohio. *USS and American are trademarks*

American Steel & Wire Division of USS **United States Steel**

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors • Tennessee Coal & Iron Division, Fairfield, Ala., Southern Distributors • United States Steel Export Company, Distributors Abroad



USE OUR CAPITAL to cut your handling and processing costs

When we do a share of the processing of your steel—the cutting, burning—you save the costs of the labor it takes and the capital invested in the equipment involved. You save expensive costs of handling. You cut scrap loss and wastage. That's good business.

You get your steel delivered quickly from stock, ready for use. Whatever your steel need, there's a nearby Steel Service Center set up to serve you.

If you're putting steel in inventory because you think it's a bargain, compare *all* of your *costs of possession* with the cost and *freedom-from-risk* of buying from your Steel Service Center. Use this chart. Or, to be more precise, get the booklet *What's Your Real Cost of Possession for Steel?* from your convenient Steel Service Center. American Steel Warehouse Association, Inc., 540 Terminal Tower, Cleveland 13, Ohio.

COST OF POSSESSION FOR STEEL IN YOUR INVENTORY

Per ton delivered	_____
Cost of capital:	
Inventory	_____
Space	_____
Equipment	_____
Cost of operation:	
Space	_____
Materials handling	_____
Cutting & burning	_____
Scrap & wastage	_____
Obsolescence	_____
Insurance	_____
Taxes	_____
TOTAL	_____

COST OF FREEDOM-FROM-RISK STEEL FROM YOUR STEEL SERVICE CENTER

Per ton, cut-to-size, and delivered	
TOTAL	_____

AMERICAN STEEL WAREHOUSE ASS'N

The American Steel Warehouse

. . . YOUR STEEL SERVICE CENTER

ECS

ELECTRONIC CONTROL SYSTEMS

LEADERS IN NUMERICAL CONTROL

S-C

STROMBERG-CARLSON

Electronic Control Systems, "Leaders in Numerical Control," is today producing DIGIMATIC machine tool controls ready for immediate installation in any factory or shop throughout the country.

To give nation-wide strength to this program, ECS has now become an integral part of Stromberg-Carlson. This new combination assures our customers the finest products and the best in customer service.

ELECTRONIC CONTROL SYSTEMS

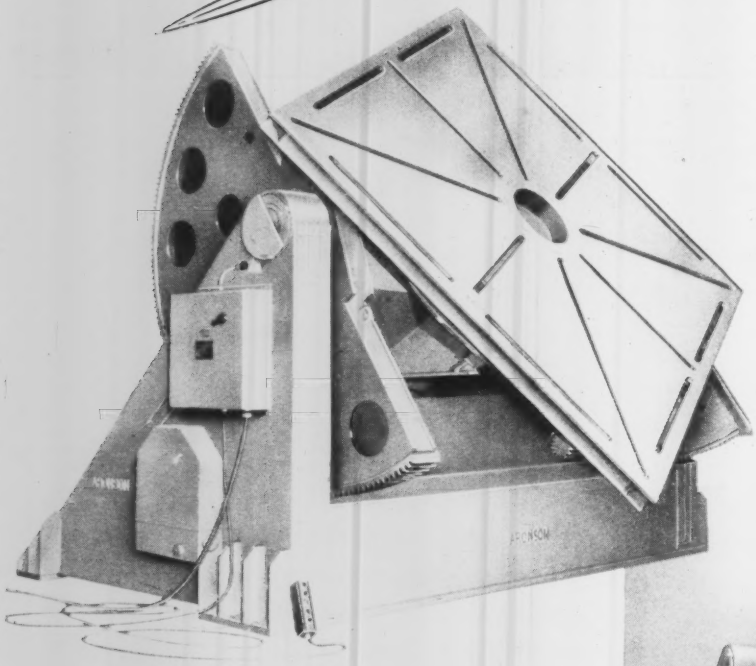
Division of

STROMBERG-CARLSON

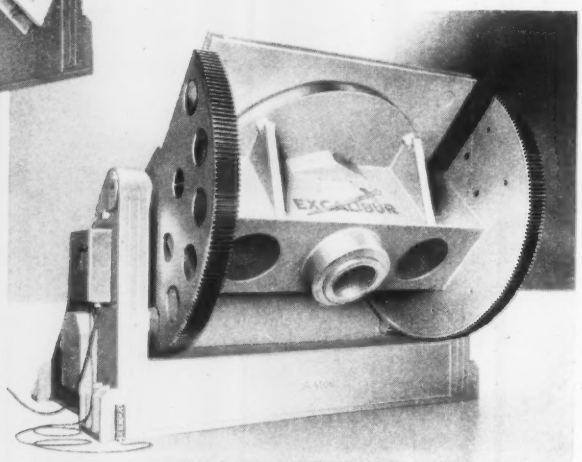
A DIVISION OF GENERAL DYNAMICS CORPORATION

2231 S. Barrington Avenue • Los Angeles 64, California

EXCALIBUR..... the HIGHEST LOAD CAPACITY Welding Positioner EVER BUILT



Aronson
MODEL G 3500



"EXCALIBUR" is rated 350,000 pounds Load Capacity with CG 12" above table and 6" off-center.

FOUR SELECTIVE VARIABLE SPEED RANGES obtained from the 4-speed gearshift transmission driven by 15 hp Varidrive afford far greater choice of variable rotation speeds. In High Gear top speed is .4 rpm adjustable to .07 rpm. This exceptionally high rotation speed permits automatic welding at high travel rate on diameters as small as eight inches! Then, for larger diameters shift into 3rd Gear and use the .23 rpm to .04 rpm range. Or, still larger work may require 2nd Gear's .13 rpm to .023 rpm range. Largest weldments are profitably rotated in Low Gear range's .08 rpm to .013 rpm.

"EXCALIBUR" is not physically tremendous, being only 88" from floor to horizontal rotation axis, which allows working both large and small weldments without needing excessive headroom and without working too high above the floor.

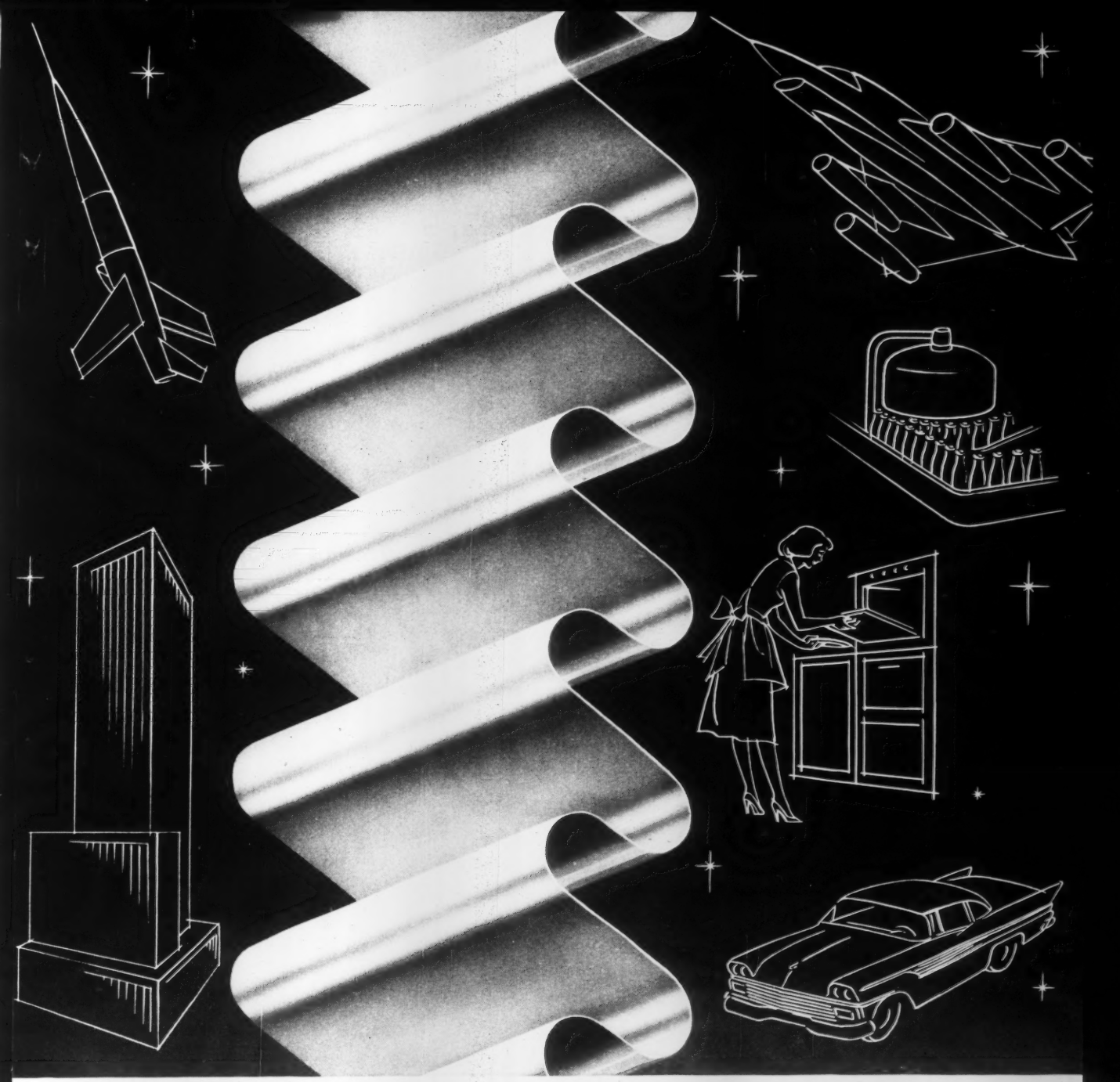
"EXCALIBUR" has been designed to handle almost every kind of weldment at lowest possible shop cost.

Owning "EXCALIBUR" opens production doors to you that are closed to your competitors. It is NOT a special job machine, but a Welding Positioner that will handle 90% of your jobs that are as small as a ton or so to as large as 175 tons!

Owning **"EXCALIBUR"** lets you weld automatically those jobs you now wrestle around the shop floor with the profit-eating crane and have to weld manually.

With **"EXCALIBUR"** in your list of machine tool facilities you not only can underbid competition but can assure the award of the contract because your customer will know you have the facility to handle his work.

Quality POSITIONERS by **Aronson MACHINE COMPANY**
ARCADE, NEW YORK



J&L STAINLESS STEEL

The Solution for Many Basic Engineering Problems

Product designers, industrial designers, and engineers find stainless steel provides advantages no other commercial metal can offer. Its ability to fabricate readily into design, its high tensile strength, its resistance to distortion under extreme hot or cold applications, plus its corrosion-free properties, gives stainless steel a distinct advantage over other basic metals.

J & L offers a wide selection of quality stainless sheet and strip to extremely close tolerances up to widths of 48". Write for these technical data:

1. Laboratory Corrosion Data.
2. Data Sheets (please specify the grades in which you are interested).

VISIT OUR BOOTH NO. 36 AT THE METAL SHOW OCTOBER 27 THROUGH 31 CLEVELAND, OHIO

Improve your Products with . . .

J&L STEEL STAINLESS

BAR • WIRE • SHEET • STRIP

Jones & Laughlin Steel Corporation • STAINLESS and STRIP DIVISION • Box 4606, Detroit 34

How Howard McGlory cut with a hard-sided

Howard F. McGlory is Bay State's special sales engineer for the Pittsburgh and Detroit areas. His job is to add his knowledge and experience to that of the many Bay State Abrasive engineers in these areas. Because of his wide and varied experience in diamond grinding wheel application problems, he has spoken, with authority, to many groups on carbide grinding.

grinding costs at Kennametal diamond grinding wheel...

As one of the nation's top producers of cemented carbide products, Kennametal, Inc., uses a lot of diamond grinding wheels; and considering the expense of diamonds, they cannot be casual about their grinding costs.

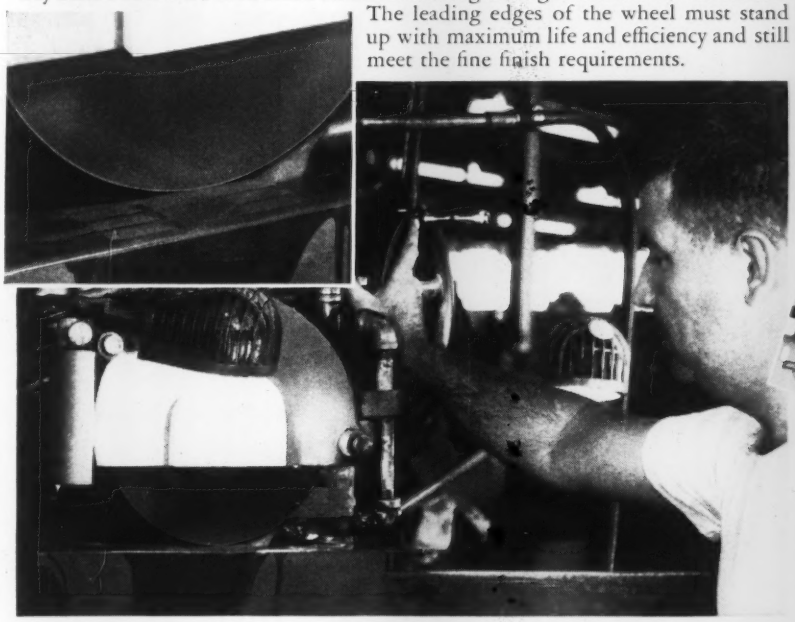
That's just where Bay State's new hard-sided diamond wheel does an outstanding job.

As Bay State's Howard McGlory puts it: "The big problem here was to get extra bond-strength at the edge of the wheel. In this manner, the wheel holds its shape. The corners do not break down faster than the center section." The wheel is unique in that it has a 1/16" hard shell on each side to hold the corners. This was the result of a special modification of Bay State's resinoid bond.

Under regular production conditions, this 10 x ½ x 3 wheel is now helping Kennametal turn out more precision-finished carbide pieces at lower cost than ever before. And it was *lower cost and superior performance,* not claims that sold Kennametal's General Superintendent, F. J. Lennon, who says: "We have just one policy on buying diamond wheels here and it's simply this—every wheel is permanently on test. We will settle for absolutely nothing less than the best at any time."

That policy suits Bay State representatives perfectly. Like Howard McGlory, they are all thoroughly trained abrasive specialists who are willing to work hard to produce convincing results. *Better grinding at lower cost . . . that is their business.*

Bay State's 10 x ½ x 3 hard-sided diamond wheel grinding cemented carbide inserts. The leading edges of the wheel must stand up with maximum life and efficiency and still meet the fine finish requirements.



This 34 page catalog is yours for the asking. It contains a great deal of helpful information, including prices. Send for a copy today.

BAY STATE ABRASIVES

BAY STATE WHEELS of PROGRESS

Bay State Abrasive Products Co., Westboro, Massachusetts.
In Canada: Bay State Abrasive Products Co., (Canada) Ltd., Brantford, Ontario.
Branch Offices: Bristol, Conn., Chicago, Cleveland, Detroit, Pittsburgh. *Distributors:* All principal cities.

CARPENTER DOUBLES PRODUCTION CAPACITY

STEEL

behind the news . . . this unprecedented move:

In a nation famed for its mass-production techniques, it is rare to find the company whose chief problem for almost 70 years has been one of *supply* rather than *demand*.

Yet the industry requirements for *Carpenter*-quality specialty steels have, in times of normal economy . . . always exceeded *Carpenter's* ability to produce.

In contrast to the giants of the steel world . . . the steels of battleships, bridges and buildings . . . *Carpenter* history is one of precision rather than might—fine quality for critical applications, rather than mammoth quantity.

Today, as the result of long-planned expansion and new acquisitions, we can offer *quantity* along with famous *Carpenter quality*. Both are now available and will continue to be available, even in times of peak demand.

While *quality* will continue to remain a sacred watchword, we will continue to lead the way and grow apace of the ever-increasing demands of atomic-age industry for the world's finest steels.

tool and die steels
stainless steels
electronic and magnetic alloys
special-purpose alloy steels
valve, heat-resisting and super alloy steels
tubing and pipe
fine wire specialties

Carpenter steel

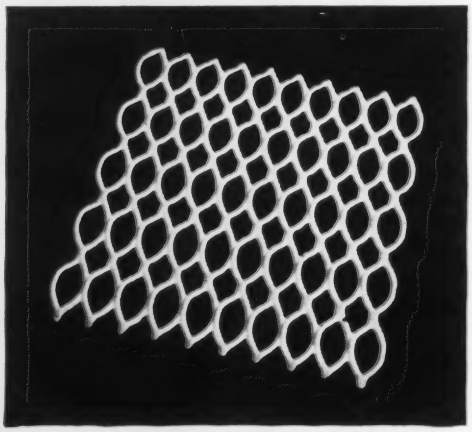
The Carpenter Steel Company, Main Office and Mills, Reading, Pa.
Alloy Tube Division, Union, N. J.
Carpenter Steel of New England, Inc., Bridgeport, Conn.
Webb Wire Division, New Brunswick, N. J.

OUTSTANDING NEW QUALITY

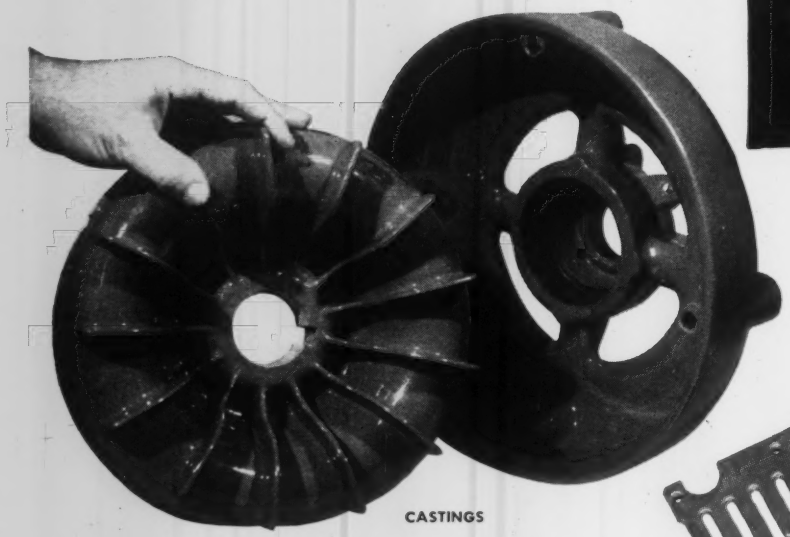
with

CORVEL†

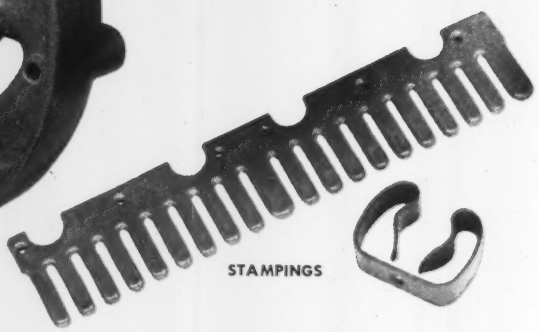
Fusion Bond Finishes



WIRE PRODUCTS



CASTINGS



STAMPINGS

• CORVEL Fusion Bond Finishes, applied by the fluidized bed process, now give these unique product finish advantages:

- Controlled thickness in one dip—from .005″ to .060″.
- Thorough coverage of corners, sharp edges, projections, joints and intersections—without bridging across gaps.
- Good adhesion to substrate surfaces.
- Resistance to corrosion and most chemicals.
- Premium appearance—multiple color selection, controlled sheen.
- Durable color and gloss.
- The RIGHT Finish for YOUR Product.

CORVEL Fusion Bond Finishes are powders specially formulated for use with the fluidized bed process. The part to be finished is first heated, then dipped into a fluidized bed of *dry* CORVEL powder. The powder, maintained in a state of whirling suspension, bonds by fusion on contact with the part.

CORVEL Finishes are now available in Cellulosic, Vinyl, Epoxy, Nylon, Chlorinated Polyether, and Ethylene base resins.

Fluidized Bed Process:

A new, patented production process for cladding metals and other materials with plastic resins—exclusively licensed in the U.S. and Canada by Polymer Processes, Inc., an affiliate company.

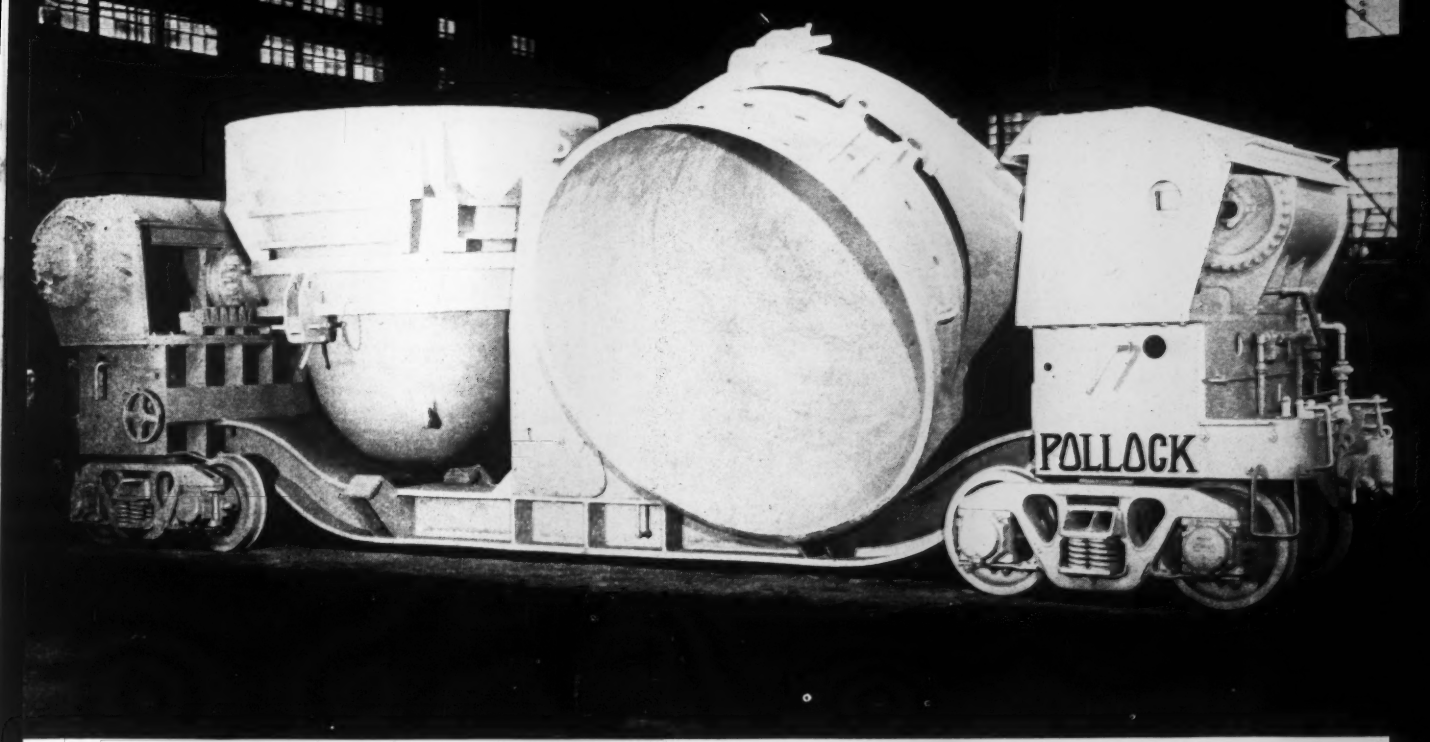
We invite your inquiry for product finish economy and improvement. Write today for our new CORVEL Bulletin.

NATIONAL POLYMER PRODUCTS, INC. / Reading, Pennsylvania

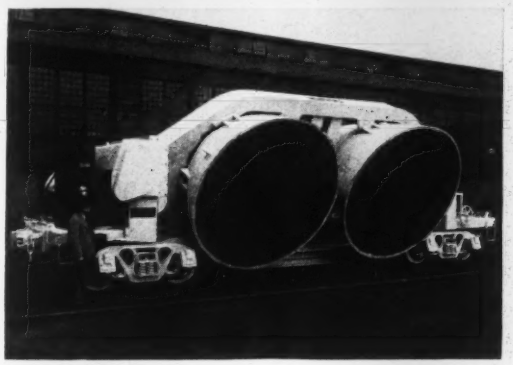
A subsidiary of The Polymer Corporation

†Polymer Corporation trademark for finishing materials

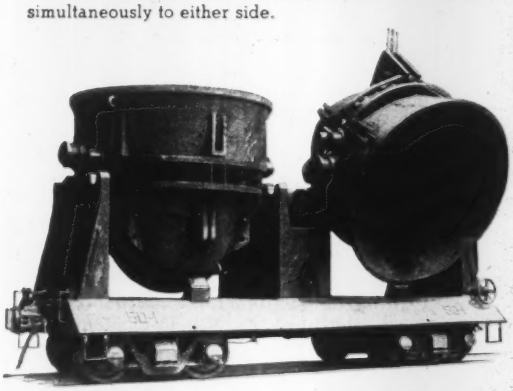
POLYPENCO®



Double pot, air operated Pollock slag car dumps to either side. Pots dump separately or together.



Pollock double pot, electrically operated car dumps pots simultaneously to either side.



Double pot, crane dumped slag car.

ONE OF THESE
DOUBLE POT SLAG CARS
IS RIGHT FOR YOU
DO YOU KNOW WHICH IT IS?

The type and size slag car you can use most efficiently and economically depends on three things: existing facilities, clearances and the use of the car. If you process slag, an electric dump gives you slow, even distribution. If you have a railroad crane or crane at the dump you can use the crane type. If you have adequate air capacity you will want the air operated cars, because they furnish the best means of dislodging skulls. The best way to select the proper car for your use is to consult the experts at The William B. Pollock Company. Most steel producers do. Pollock has built more slag cars, of all types, than anyone else in the world.

THE WILLIAM B. POLLOCK COMPANY
Since 1863

YOUNGSTOWN, OHIO

ENGINEERS • FABRICATORS • ERECTORS • STEEL PLATE CONSTRUCTION

BLAST FURNACES • HOT METAL CARS AND LADLES • CINDER AND SLAG CARS • INGOT MOULD CARS • CHARGING BOX CARS • WELDED OPEN HEARTH LADLES

Tubexperience in action

Made to pass the severest tubing test of all

14 different tests have proved it now ready for reactor use

*Superior tubing for applications in the atomic energy field is usually produced to meet highly exacting specifications. A length of tubing like the one shown above may well undergo all the tests and inspections listed here—plus special ones required by the customer.

1. Visual surface check
2. Dimension check (using precision measuring instruments)
3. Hydrostatic test
4. Eddy current inspection
5. Tensile and elongation test
6. Rockwell hardness test
7. Flare & flatten test
8. Dye penetrant (over entire length of tube)
9. Metallographic mount (for checking analysis, temper, grain size and structure)
10. Quantitative and qualitative analysis
11. Corrosion tests (Huey, salt spray, Strauss, autoclave, etc.)
12. Spectroscopic examination
13. X-ray inspection
14. Ultrasonic inspection

We offer many special services, and of our more than 120 available analyses, many are important to atomic tubing users. Equally important are such factors as our ability to produce tubing to extremely close tolerances; the weldability of the stainless and zirconium and nickel base alloy tubing we supply; and our ability to supply stainless alloys and other materials with very closely controlled chemical composition (Type 348, for example, with cobalt held to .10 maximum).

For more information, write us, giving such pertinent facts as the alloys in which you are interested and the end use of the tubing. We will be glad to send you Data Memorandum No. 20, "Tubing for Atomic Power." Write Superior Tube Company, 2005 Germantown Ave., Norristown, Pa.

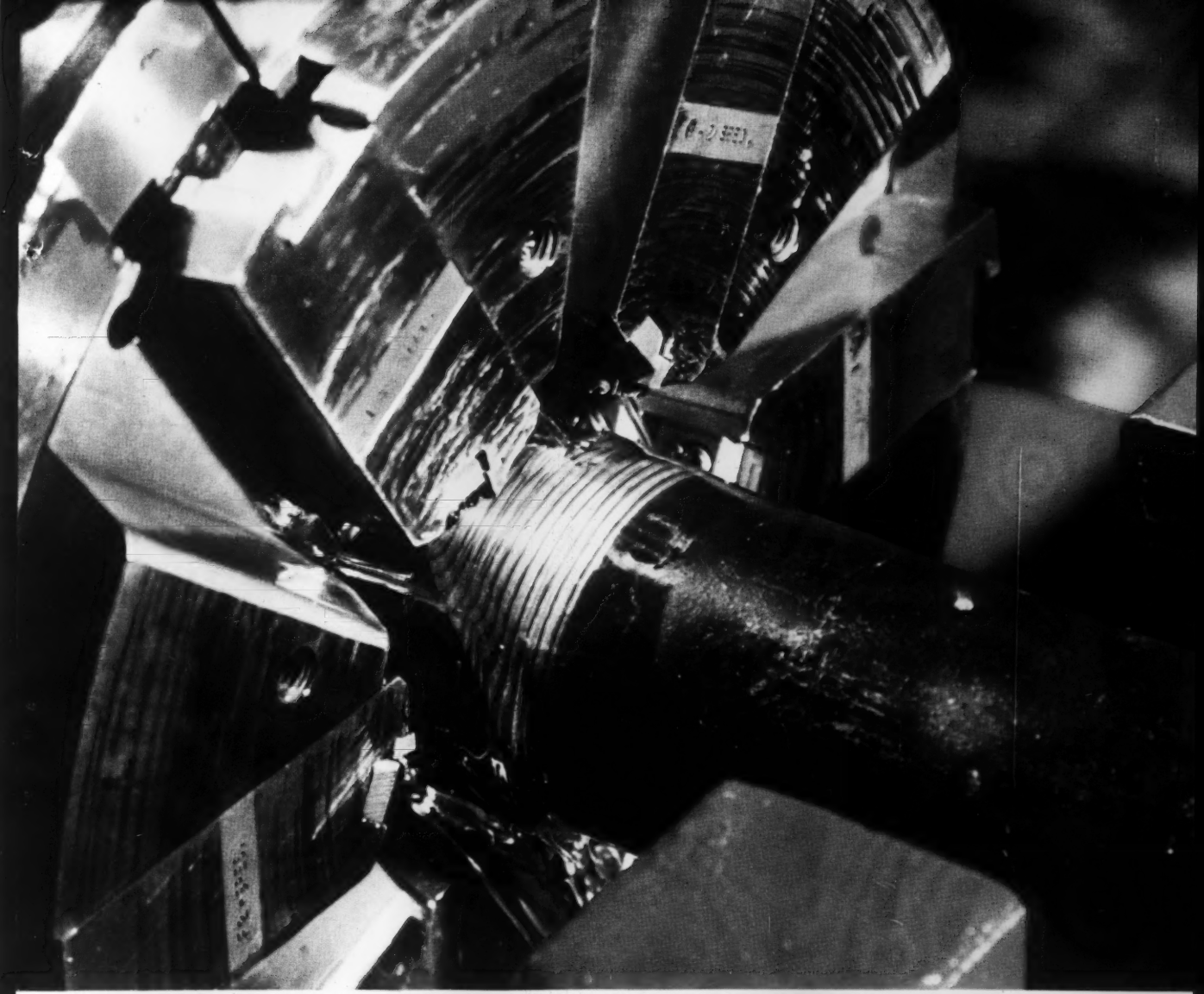
Superior Tube

The big name in small tubing

NORRISTOWN, PA.

All analyses .010 in. to ⅝ in. OD—certain analyses in light walls up to 2½ in. OD

West Coast: Pacific Tube Company • 5710 Smithway St., Los Angeles 22, Calif. • RAymond 3-1331



This is just one of the many applications of Sunicut 85, which is one of a whole series of Sunicuts . . . all transparent.

SUNICUT 85 is a heavy-duty cutting oil that lets you see what you're doing

Transparent, fast-draining Sunicut 85 leaves the workpiece clear for inspection as you go.

Especially designed for use on high-alloy steels, Sunicut 85 is ideal for heavy-duty work on automatic screw machines and production form grinders. It's a natural for pipe threading and similar heavy-duty operations requiring frequent and close inspection.

Easy pumping, fast metal-wetting, and excellent extreme-pressure lubrication are other advantages of Sunicut that lead to production economy for you.

Ask your Sunoco representative about saving money with Sunicut, or write to Dept. I-10.

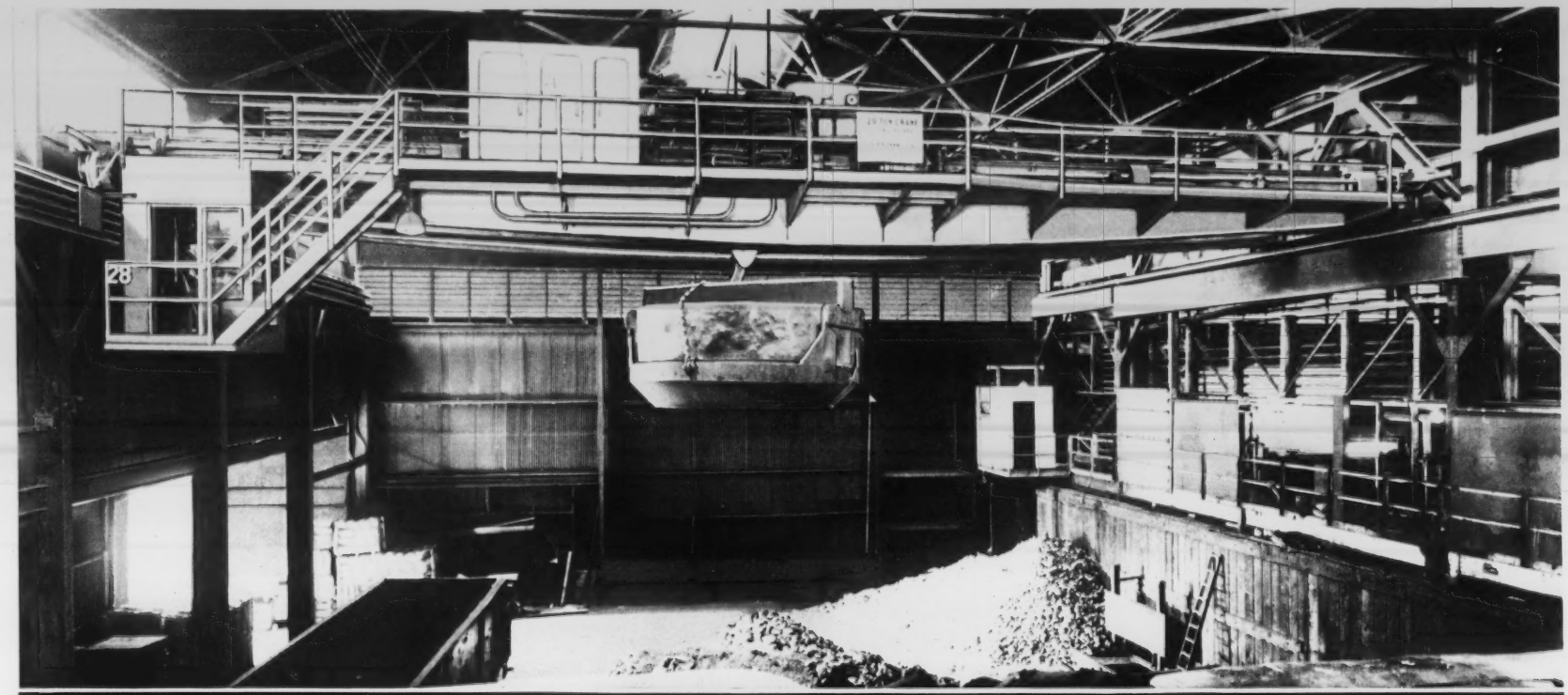
Industrial Products Department

SUN OIL COMPANY, Phila. 3, Pa.

SUNOCO

© 1958 SUN OIL COMPANY

In Canada: Sun Oil Company Limited, Toronto and Montreal.



VICTOR R. BROWNING

Mill Type Cranes

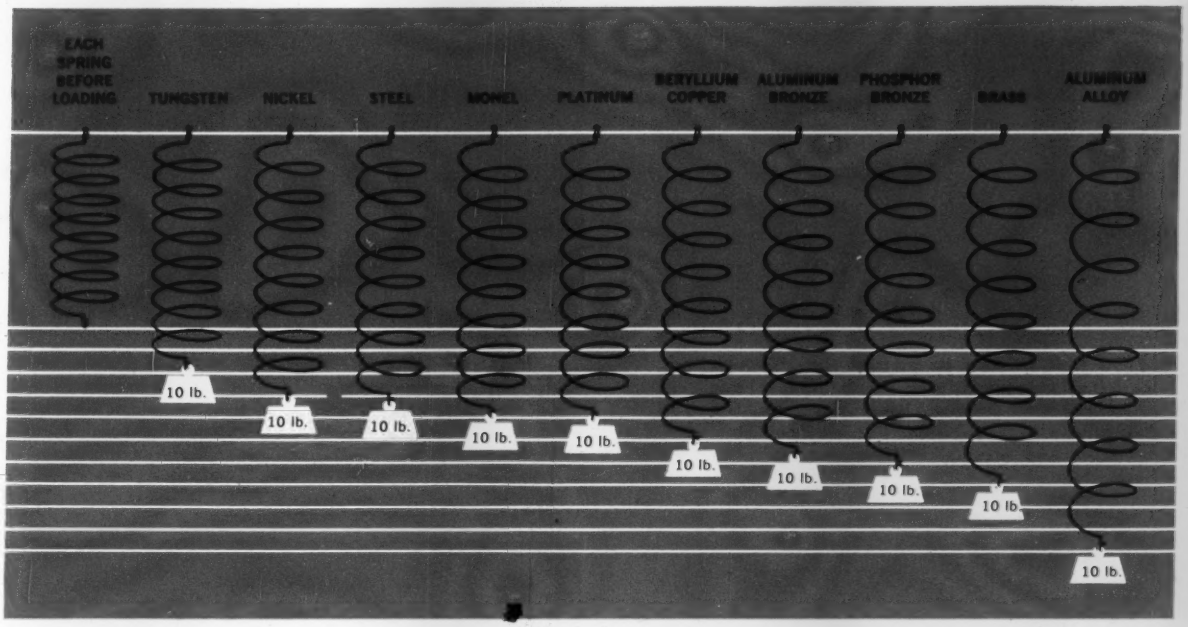
TO SPECIFICATION...

Basically designed as required by A.I.S.E. specifications, mill type cranes built by Victor R. Browning & Co., Inc. also offer the opportunity of specifying preferences and standards prevailing in the purchaser's plant. May we have your next inquiry?

VICTOR R. BROWNING & COMPANY, Inc.

WILLOUGHBY (CLEVELAND), OHIO

DESIGNERS AND BUILDERS OF ELECTRIC OVERHEAD TRAVELING CRANES AND HOISTS AND ELECTRIC REVOLVING CRANES



How much deflection do you want in a spring ?

The wide range of stiffness characteristics available in different materials offer unusual opportunity to solve spring deflection problems. How wide is shown in the chart above. The tension springs are all of identical dimensions but of different materials and indicate the relative deflection obtained from applying the same load (assuming the stresses are within safe limits). This basic principle is often overlooked in the approach to spring selection not only of extension springs but other types: flat, torsion, etc. Because our daily work includes such a wide range of spring usage, we are in a position to help you in the early stages of spring consideration, both in material selection and production short cuts. A handy pamphlet to have at your elbow is our "Metal Selector." Write for your copy.

Associated Spring Corporation

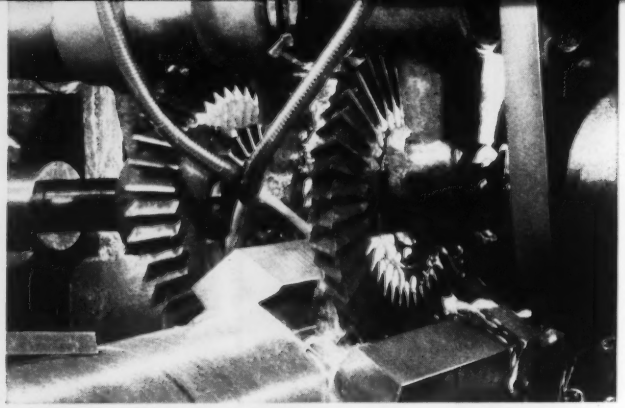
General Offices: Bristol, Connecticut

Wallace Barnes Division, Bristol, Conn. and Syracuse, N. Y.
B-G-R Division, Plymouth and Ann Arbor, Mich.
Gibson Division, Chicago 14, Ill.
Milwaukee Division, Milwaukee, Wis.
Raymond Manufacturing Division, Corry, Penna.
Ohio Division, Dayton, Ohio
F. N. Manross and Sons Division, Bristol, Conn.
San Francisco Sales Office, Saratoga, Calif.
Seaboard Pacific Division, Gardena, Calif.
Cleveland Sales Office, Cleveland, Ohio
Dunbar Brothers Division, Bristol, Conn.
Wallace Barnes Steel Division, Bristol, Conn.
Canadian Subsidiary: The Wallace Barnes Co., Ltd., Hamilton, Ontario and Montreal, Quebec

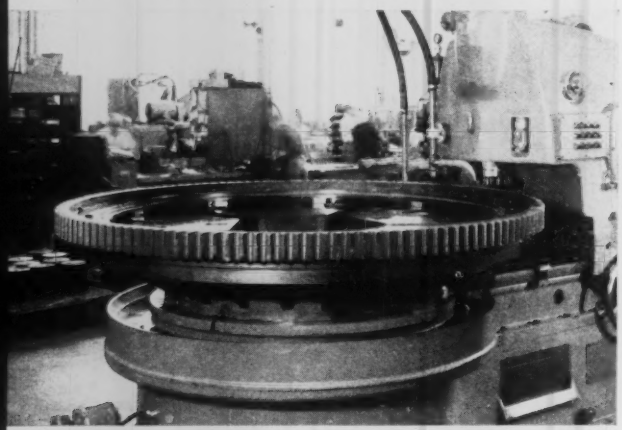
5804

ALCO FORGINGS

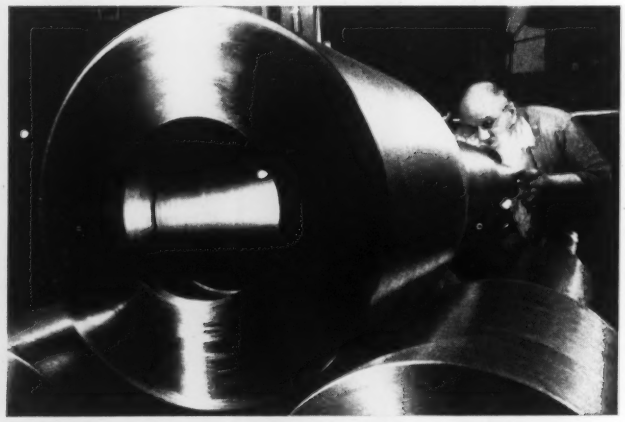
SAVES $150 PER GEAR—In cutting a double-web design fabricated gear on a gear generator, tool cost formerly averaged $180 per gear. By switching to ALCO Hi-Qua-Led Steel with its lower friction component, tool wear is reduced, and manufacturer reports savings of approximately $150 per gear.



MILLING TIME DOWN 71%—Hi-Qua-Led Steel open-die forgings enabled a machine tool builder to reduce time for straddle-mill dovetailing of pentagon shape by 71%. Overall time for piece, including milling, turning and trepanning, is cut 33%, and a significant saving in tools is also noted.



IMPROVED FINISH—A manufacturer reports a much smoother gear finish with ALCO Hi-Qua-Led Steel. There is a complete lack of burrs which formerly required extensive hand filing to remove. In addition, time for this cutting operation on a Fellows gear shaper is reduced 47%, and tool wear is down 20%.

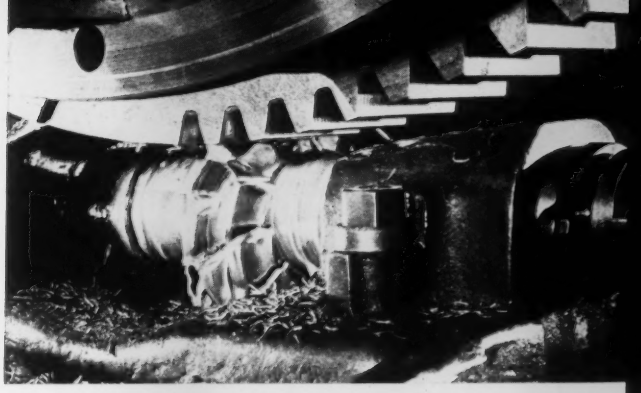


700% INCREASE IN TOOL LIFE—In trepanning a 4 in. diameter hole 42½ in. long with a Warner & Swasey lathe, tool life averaged one piece per tool. With Hi-Qua-Led, 8 pieces are now obtained with the same tool. Manufacturer reports that Hi-Qua-Led Steel also provides much better chip formation.

EASY-MACHINING HI-QUA-LED STEEL* FORGINGS GIVE INDUSTRY NEW OPPORTUNITY FOR PROFIT

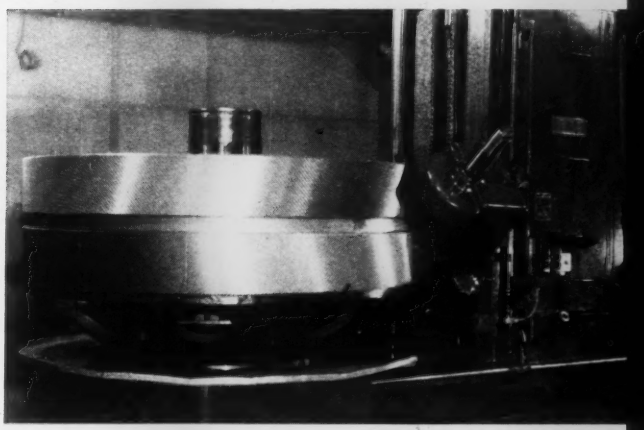
* **HI-QUA-LED STEEL**—ALCO's registered trademark for its new process leaded-steel forgings that are making outstanding reductions in tool wear, machining time and production costs.

TOOL DOES 3 TIMES THE WORK—With Hi-Qua-Led Steel, a King boring mill operation that once required 3.4 hours is off the machine in 43 minutes. Through the lower frictional properties of Hi-Qua-Led Steel, the manufacturer obtains 10 pieces per tool grind as compared to 3 pieces obtainable with non-leaded steel.



8-HOUR JOB DONE IN 3—Another manufacturer reports that roughing and finishing a gear required a total of 8 hours and 8 minutes on his gear cutter. With freer-machining Hi-Qua-Led Steel and the increased speeds and feeds it permits, the job is now completed in just 3 hours and 10 minutes.

FASTER SPEEDS, NORMAL TOOL WEAR—A gear manufacturer using a Fellows gear cutter was able to increase rough-cut speed 37% and finish-cut speed 111% with Hi-Qua-Led Steel. Smoother operation is noted, and the tremendous reduction in machine time is accomplished with only normal wear to cutter.



SAVES FULL WORK WEEK—Using gear blanks of ordinary steel, roughing and finishing on a Gould and Eberhardt machine previously required 65.1 hours. The improved machining qualities of Hi-Qua-Led Steel have speeded up gear production and the job is now completed in 24.9 hours, saving a 40-hour work week.

The easy machinability of ALCO's Hi-Qua-Led Steel® forgings is setting new production records and boosting profit throughout industry. While maintaining all the physical characteristics of regular steel in any AISI grade, forgings of Hi-Qua-Led Steel, ALCO's special process leaded steel, provide the extra benefits of greatly reduced machine time, longer tool life and improved surface finish. In addition, the reduced friction component of Hi-Qua-Led Steel forgings assures much closer tolerances.

By switching to ALCO's Hi-Qua-Led Steel forgings in your operation, you can cut your machining costs drastically. Along with this reduction in costs, Hi-Qua-Led Steel forgings will provide the same service in your end product as you obtain with regular forgings.

ALCO specialists are available to show you—on your own machines, in your own plant—how Hi-Qua-Led Steel forgings will boost your profit. Forgings are available in seamless rolled circular shapes from 18 to 145 in. OD, in open-die shapes from 1,000 to 30,000 lb and 40 ft long, and in mandrelled seamless circular shapes up to 60 in. wide. Contact the ALCO sales office nearest you for complete details. For a booklet containing technical information on Hi-Qua-Led Steel forgings, write ALCO Products, Inc., Dept. 153, Schenectady 5, New York.

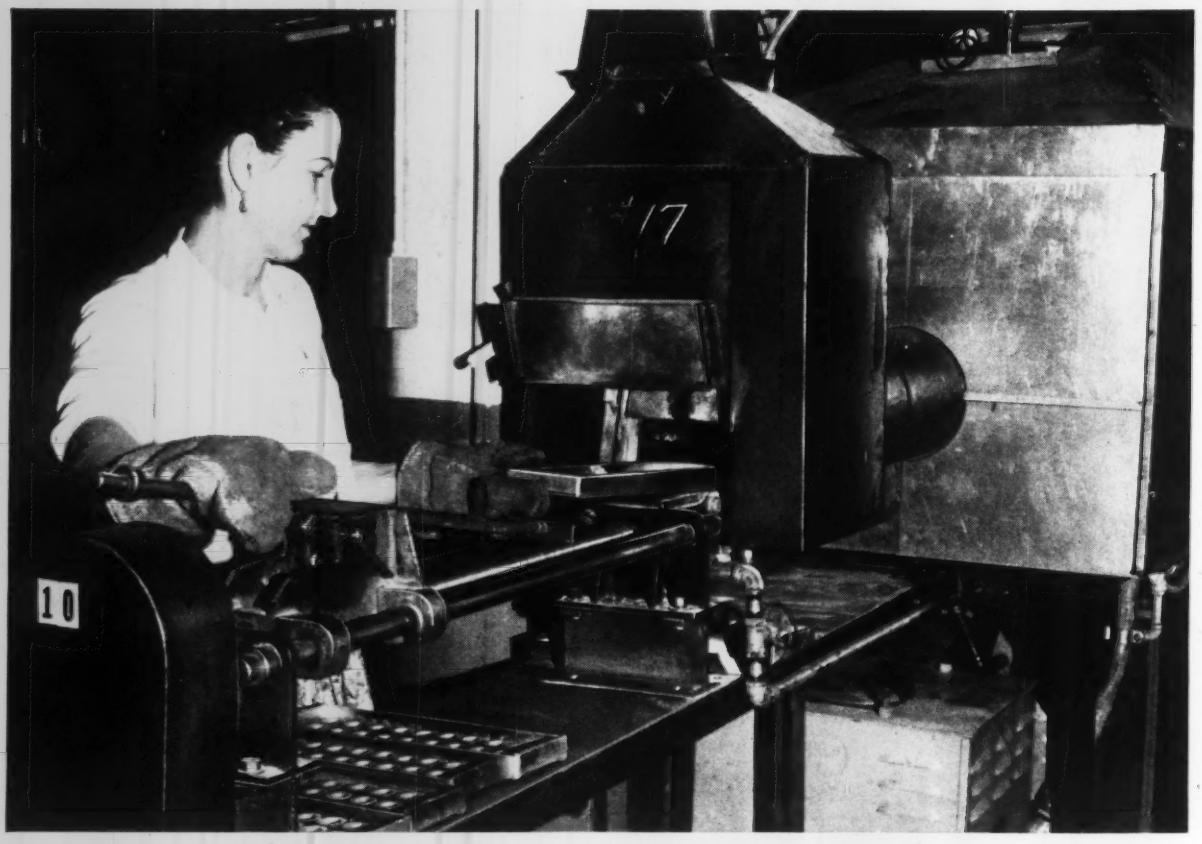
ALCO

ALCO PRODUCTS, INC.

NEW YORK

SALES OFFICES IN PRINCIPAL CITIES

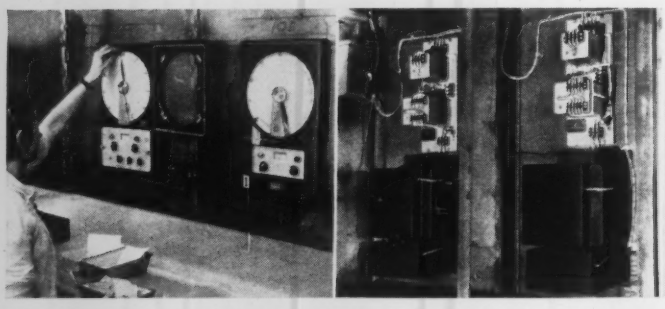
LOCOMOTIVES · DIESEL ENGINES · NUCLEAR REACTORS · SPRINGS · STEEL PIPE · FORGINGS · OIL-FIELD EQUIPMENT



Fansteel Metallurgical Corp.: Operator loads sintering furnace with trays of FASTELL® heavy duty electrical contacts.

Critical sintering temperatures a problem?

Not at Fansteel Metallurgical Corp., where Speedomax® H is regulating moly heaters and simplifying control of critical sintering temperatures. With temperature dependent upon load density and compact composition, Fansteel depends upon experience for the right temperature . . . upon Speedomax H for control reproducibility. Rugged, compact and completely reliable, this controller continuously regulates power input to moly heaters . . . holds furnace temperature well within specified limits. Speedomax H is providing the same dependable control on numerous heat treat processes . . . is helping produce both process economies and a quality product. *Whatever your heat treat, it'll pay you to investigate Speedomax H!* For details, contact your nearest L&N office or write 4957 Stenton Ave., Phila. 44, Pa.



"H" C.A.T. control brings furnace from 900 to 1300 C in 16 minutes without overshoot or hunting. Magnetic amplifiers are conveniently mounted on panel back.

LEEDS Instruments **NORTHRUP** Automatic Controls • Furnaces

Stainless Steel Service
the Ingersoll way

Service is a word that gets kicked around a lot—often tossed off lightly and loosely. But here at Ingersoll Steel, *service* is a word we live by.

It means, for example, tailoring our production schedules to *your* requirements. It means producing to your exact analysis, size and thickness specifications. It means quality control to assure uniformly high quality from one order to the next, so you can depend on the fabricating characteristics you expect. It means deliveries timed to your production needs. It means providing technical information whenever required.

So next time you need stainless sheets or plates —solid, heat-resisting, or clad—call Ingersoll Steel and get a new slant on *service*.

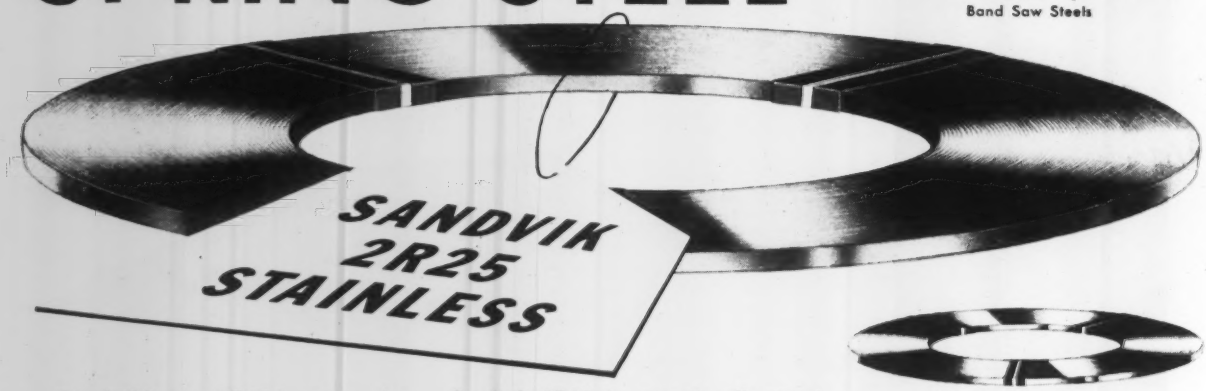
Our telephone number is New Castle (Indiana) 132

Ingersoll STEEL DIVISION
Borg-Warner Corporation
New Castle, Indiana

New Star Performer In The Sandvik Line

SANDVIK

Presents A SUPER SPRING STEEL



Hardened & Tempered Spring Steel

Annealed Spring Steel

Band Saw Steels

Flapper Valve Steel

Piston Ring Steels

Razor Blade Steel

Shock Absorber Steel

Sandvik's new 2R25 is a superior grade of stainless spring steel which goes far beyond the capabilities of ordinary spring steels. It was developed for applications where performance outranks cost.

This new steel is a prime example of Sandvik's ability to combine several advantageous properties in one metal.

Mechanical Data on 2R25 —

TENSILE STRENGTH RANGE — Hard Rolled 242,000 • 270,000 or 299,000 PSI Heat Treated 270,000 • 299,000 or 327,000 PSI

ELASTIC LIMIT (.01% Proof Stress) — From 156,000 to 192,000 PSI according to size and finish

Sandvik 2R25 is exceptionally tough and resilient, much more formable than hardened and tempered steel, has up to 10 times the fatigue life of ordinary carbon spring steel and has excellent corrosion resistance under varying atmospheric conditions.

MODULUS OF ELASTICITY — 27.7 to 35.6 x 10^6 PSI according to size and finish

SIZES (with extremely close tolerances)
Thickness — .0016" to .035"
Width — .039" to 3.94"

For further information on Sandvik 2R25, contact your nearest Sandvik office

Sandvik stocks a wide variety of qualities and sizes of cold rolled specialty strip steels. In addition Sandvik has rolling, slitting, edge-filing and hardening and tempering facilities. *Send for your copy of this free brochure* which gives specific data on the leading types of Sandvik steels.

SANDVIK STEEL, INC.

1702 Nevins Road, Fair Lawn, N. J.
Tel. SWarthmore 7-6200 • In N. Y. C. ALgonquin 5-2200
Branch Offices: Cleveland • Detroit • Chicago • Los Angeles
SANDVIK CANADIAN LTD. P.O. Drawer 1335, Sta. O. Montreal 9, P. Q.
Works: Sandviken, Sweden

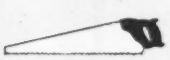
SPRING STEEL

SPRINGS

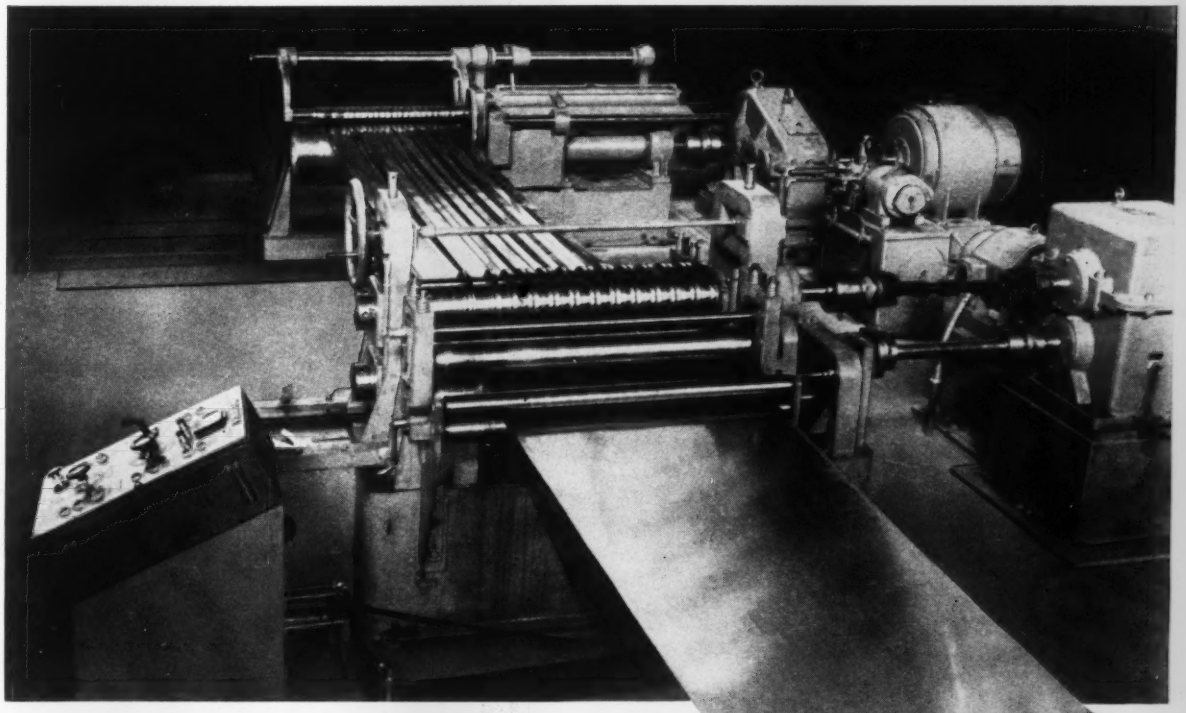
CORONANT CARBIDE TOOLS

STEEL BELT CONVEYORS

HAND SAWS & TOOLS



55-178



Greater Profit and Operational Flexibility with a YODER SLITTER

Even if you use less than 100 tons of varied strip sizes per month, it will pay you to investigate the savings that are possible through the operation of a Yoder slitter. Savings per ton increase rapidly as coil size and width of strands decrease . . . so much, that under average operating conditions, a slitter will pay for itself in a few months.

From a small stock of standard mill-width coils, a Yoder slitting line enables you to meet unexpected demands, or to supply "special" width slit strands in a matter of a few hours. This flexible operation increases plant efficiency, resulting in savings of time and money through simplified production planning and greatly reduced strip inventories.

The Yoder line includes slitters of every size and capacity for coil or sheet stock. Send for the all-new, 1958 edition of the Yoder Slitter Book. It is a comprehensive text on the mechanics and economics of slitter operations with time studies, cost analyses, and other valuable data. Write to:

Visit Booth 2770, Metal Show
Cleveland, Ohio, October 27-31

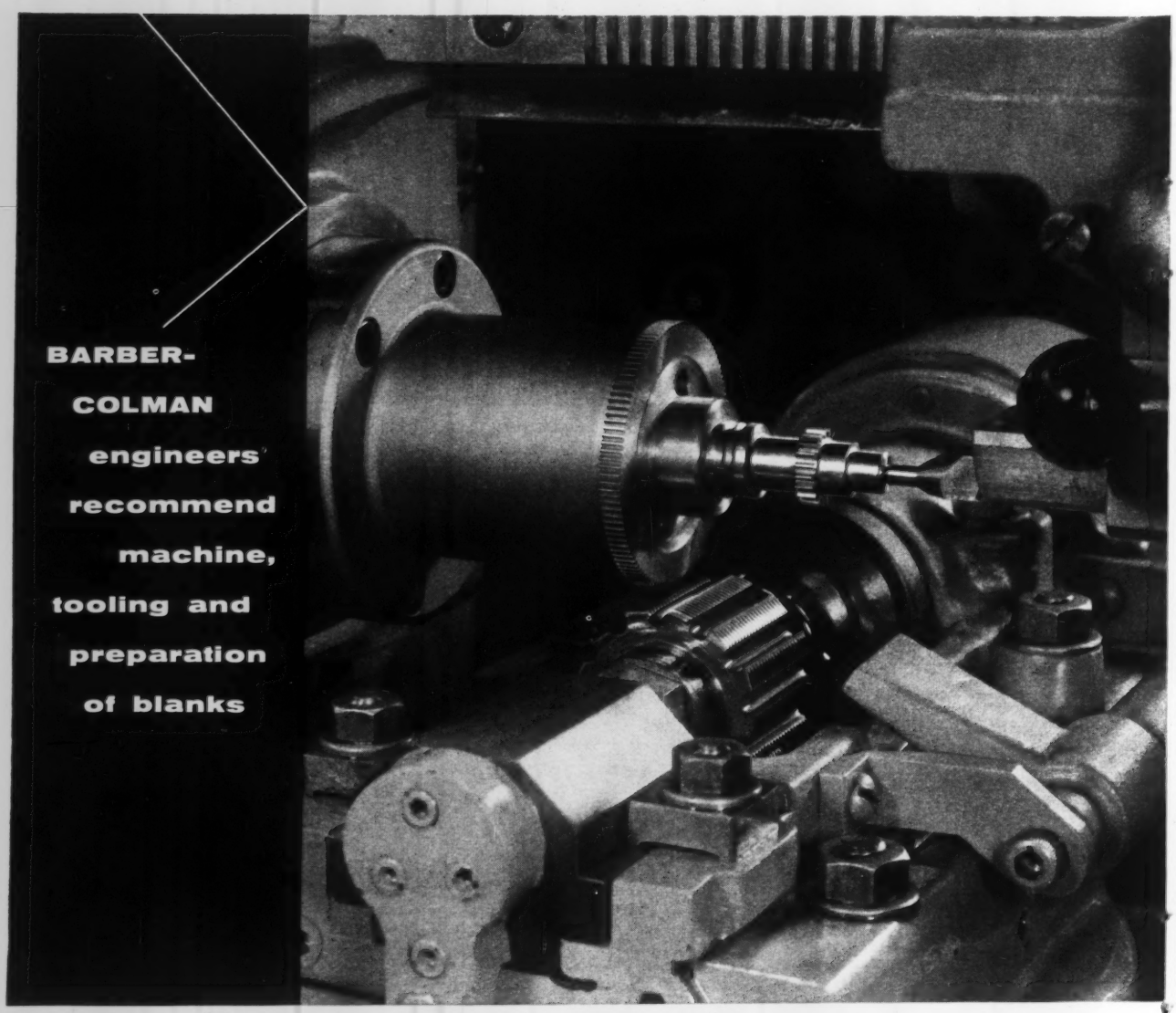
THE YODER COMPANY
5502 Walworth Avenue • Cleveland 2, Ohio

ENGINEERING
YODER
MANUFACTURING

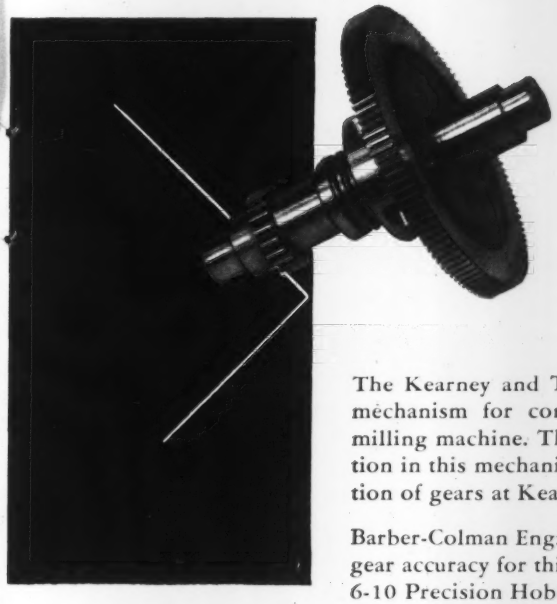
ROTARY SLITTING LINES
PIPE AND TUBE MILLS (ferrous or non-ferrous)
COLD ROLL FORMING MACHINES

GUARANTEED ACCURACY

with standard-type precision hobbing machines



BARBER-COLMAN engineers recommend machine, tooling and preparation of blanks



The Kearney and Trecker Corporation have designed a servo-control mechanism for controlling an airframe section profile and contour milling machine. The extreme accuracy required for the transfer of motion in this mechanism demanded a whole new approach to the production of gears at Kearney and Trecker.

Barber-Colman Engineers were consulted for their suggestions to assure gear accuracy for this program. They recommended a standard-type No. 6-10 Precision Hobbing Machine and designed special tooling for each of the eight gears in the mechanism. They also specified the preparation of the blanks for hobbing.

This machine is guaranteed to cut a 4″ diameter spur gear within .0002″ adjacent and .0004″ non-adjacent spacing error checked on an optical dividing head. The blanks are ground on the diameter and sides, holding the diameter, parallelism and radial and axial runout within .0001″. Two holes are provided for driving the gear during hobbing.

These photographs show one of the gears in the train and the special tooling designed for it. The blanks are located between centers and are driven by a diamond-shaped pin in the backing plate. For hobbing this 48 D.P., 115 tooth gear, a feed of .010″ is used, and the hob speed is 183 R.P.M. The material is stress-proof steel R.C. 27. Barber-Colman Class AA taper-bore hobs are used and resharpened to original hob accuracy on a Barber-Colman No. 6-5 Hob Sharpening Machine.

With this equipment and recommended procedure, all gears in the train are hobbed well within Precision Class 2 AGMA tolerances. The success of this program is indicated by the results obtained on the example shown. Inspection shows these gears are consistently within .0002″ tooth-to-tooth and .0004″ total composite error.

Accuracy of this degree is not unusual with Barber-Colman machines and hobs. This case shows the results which can be obtained by working closely with, and following the recommendations of, experienced hobbing technicians. When you have applications requiring accurate gears, consult Barber-Colman hobbing experts for their recommendations.

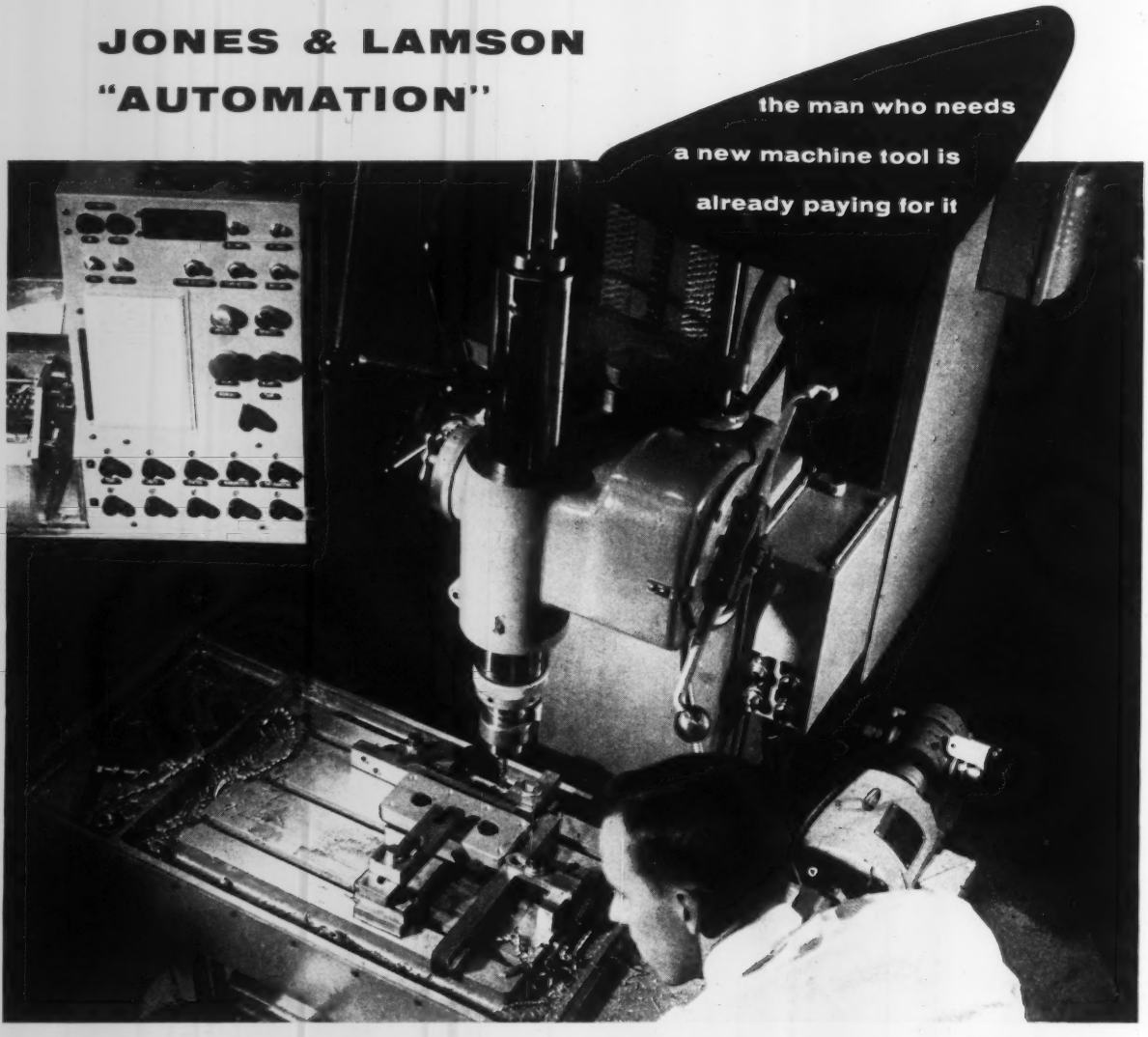
BARBER-COLMAN COMPANY

6310 ROCK STREET • ROCKFORD, ILLINOIS

Hobs • Cutters • Reamers • Hobbing Machines • Hob Sharpening Machines

BARBER COLMAN

JONES & LAMSON "AUTOMATION"



Numerical control positioning eliminates jigs – saves time

The J&L Numerically Controlled Positioning Table quickly and accurately positions work pieces to an accuracy of ±.001″ without jigs. And it can do it economically with any lot size down to a single piece.

For instance: in one installation, where precision parts previously had been machined on a conventional spacing table, J&L's new equipment achieved cycle time savings of six minutes per piece and set-up savings of over 116 minutes per set-up, or a total savings of 6.95 hours on a lot of 50 pieces.

In another plant, the cost of building $4,000 worth of jigs was eliminated during the first six weeks of operation. And in still another operation, the positioning table not only reduced set-up and cycle time, but also eliminated the storing, handling and maintenance of $29,000 worth of jigs.

You can get in on this kind of savings too. Write to Jones & Lamson Machine Company, 517 Clinton Street, Springfield, Vermont.

Turret Lathes • Fay Automatic Lathes • Milling & Centering Machines • Thread & Form Grinders • Optical Comparators • Thread Tools

Of course everyone knows that heat treating today has become one of the most serious technical and vital functions of the current metalworking activity. But a smile and laughter are still also important and the cartoons shown here are for that purpose.

We hope they make you grin and when it's heat treating services you require or skilled, technical advice about part design or heat treatability, check with

METAL TREATING INSTITUTE
271 NORTH AVENUE
NEW ROCHELLE, NEW YORK

or any member listed below.

"ARE YOU SURE YOU UNDERSTAND THE PROPER BLAST CLEANING PROCEDURE?"

American Metal Treatment Co.
Elizabeth, New Jersey
Anderson Steel Treating Co.
Detroit, Michigan
Benedict-Miller, Inc.
Lyndhurst, New Jersey
Bennett Heat Treating Co., Inc.
Newark 3, New Jersey
Commercial Metal Treating, Inc.
Bridgeport, Conn.
Cook Heat Treating Co. of Texas
Houston 11, Texas
The Dayton Forging & Heat Treating Co.
Dayton 3, Ohio
Dominy Heat Treating Corp.
Dallas, Texas
Drever Company
Philadelphia 33, Pennsylvania
Greenman Steel Treating Company
Worcester 5, Massachusetts
Fred Heinzelman & Sons
New York 12, New York
Alfred Heller Heat Treating Co.
New York 38, New York

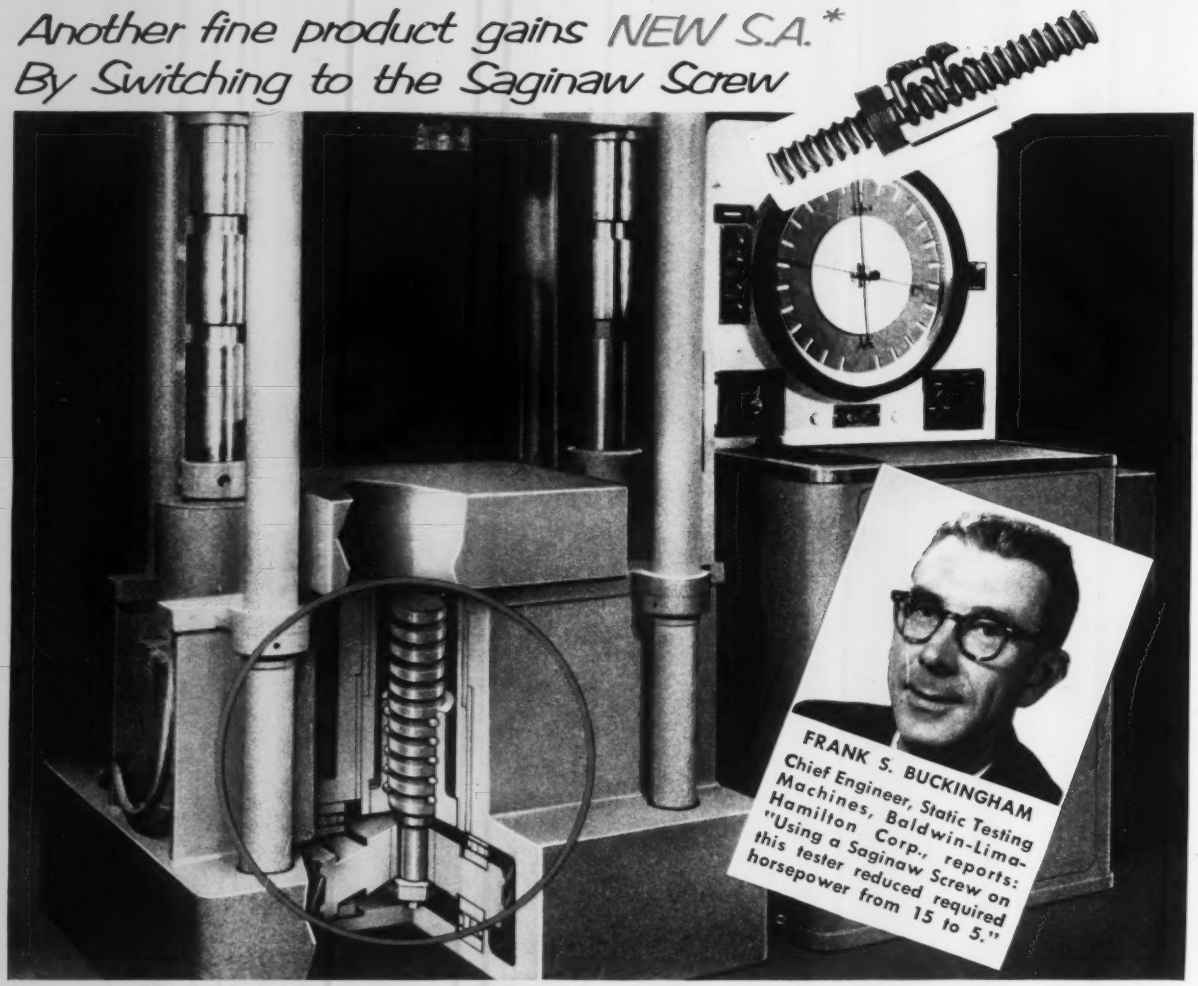
MTI MASTER CRAFTSMEN METAL TREATING INSTITUTE

Hollywood Heat Treating Co.
Los Angeles 38, California
Ipsenlab of Rockford, Inc.
Rockford, Illinois
L-R Heat Treating Company
Newark, New Jersey
The Lakeside Steel Improvement Co.
Cleveland 14, Ohio
Metallurgical, Inc.
Minneapolis 14, Minnesota
Metallurgical, Inc.
Kansas City 8, Missouri
New England Metallurgical Corp.
South Boston 27, Massachusetts
Owago Heat Treat, Inc.
Apalachin, New York

Paulo Products Company
St. Louis 10, Missouri
Pittsburgh Commercial Heat Treating Co.
Pittsburgh 1, Pennsylvania
Pittsburgh Metal Processing Co., Inc.
Pittsburgh 15, Pennsylvania
The Queen City Steel Treating Co.
Cincinnati 25, Ohio
J. W. Rex Company
Lansdale, Pennsylvania
Stanley P. Rockwell Company
Hartford 12, Connecticut
Scott & Son, Inc.
Rock Island, Illinois
Syracuse Heat Treating Corp.
Syracuse, New York
Temperature Processing Co.
North Arlington, New Jersey

CANADA
Ipsenlab of Canada Ltd.
Toronto, Ontario

Another fine product gains NEW S.A. By Switching to the Saginaw Screw*



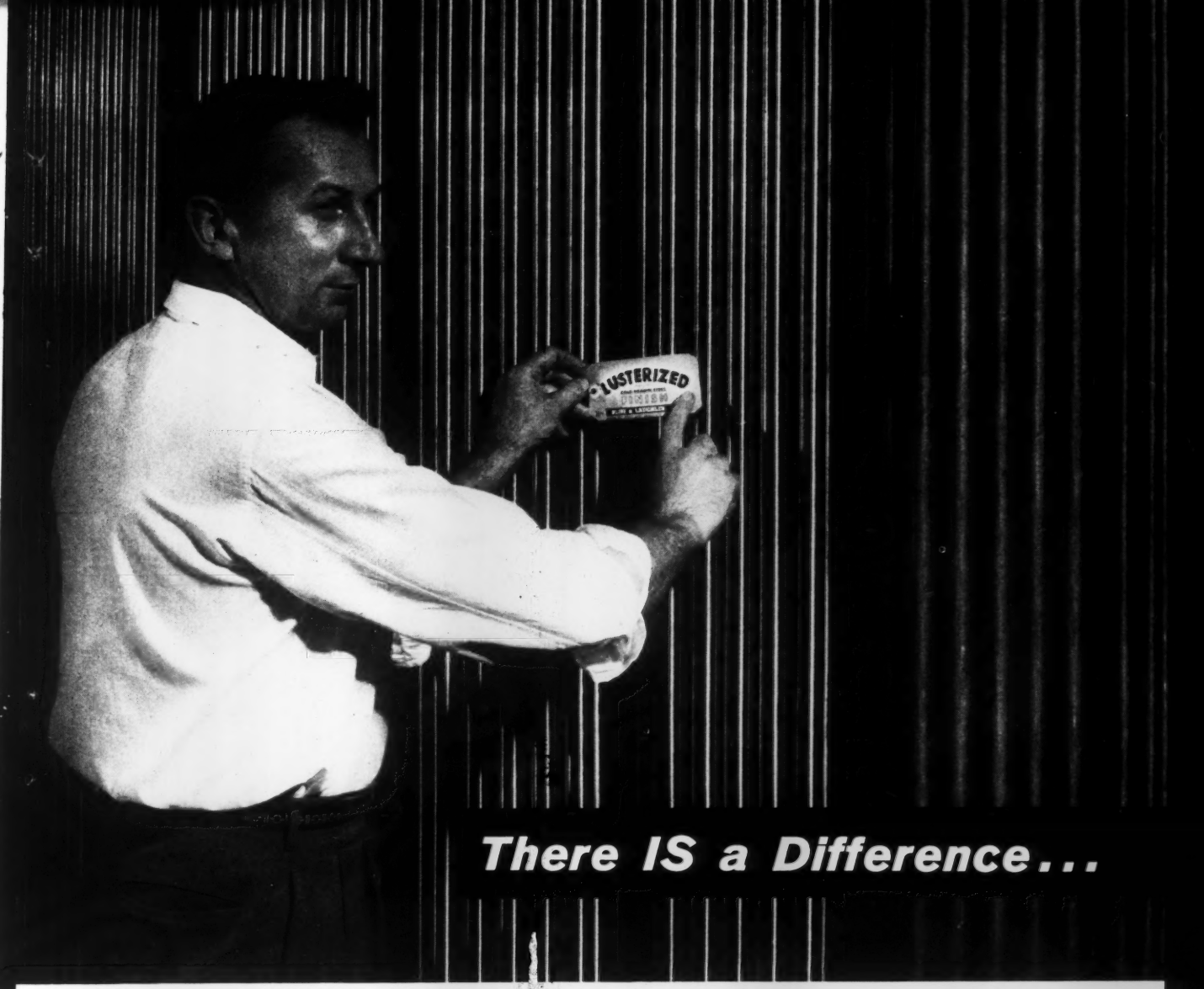
WORLD'S MOST EFFICIENT ACTUATOR OPERATES 75-TON BALDWIN TESTER WITH 5 H.P. INSTEAD OF 15

When you can cut power requirements 66% you give your product a lot more ***S**ales **A**ppeal—and that's just what Baldwin-Lima-Hamilton has done by switching from an acme thread to a preloaded Saginaw b/b Screw. What's more, it speeds up cycling and ends fretting corrosion, too.

The truly amazing ability of the Saginaw Screw to convert rotary motion to linear motion with over 90% efficiency is saving power, space, weight and assuring smoother, more dependable performance in countless products from miniature electronic controls to giant production equipment.

Perhaps the Saginaw Screw can give *your* products that vital new **S**ales **A**ppeal you're looking for right now. To find out, write or telephone Saginaw Steering Gear Division, General Motors Corporation, Saginaw, Michigan—*world's largest producers of b/b screws and splines.*

*Give your products NEW SALES APPEAL... switch to the Saginaw ball bearing Screw



There IS a Difference...

...a BIG DIFFERENCE in Cold Drawn Bars

Contrary to popular belief, all cold drawn bar steel is not alike. There is one big difference worthy of your specification—the Bliss & Laughlin difference.

Only B&L Lusterized® cold finished bars are different from all others. B&L bar steel is cleaner, brighter, easier to handle. The exclusive B&L cold finishing process (patent applied for) removes drawing oils, lime and processing grit, producing a smooth, gleaming bright surface without processing contaminants to slow your production. And B&L special protective oil keeps dirt, dust and other airborne contaminants from the Lusterized surface until you are ready to process the bars.

This big difference over other cold finished bar steel is another benefit developed from B&L research since 1891 to produce better cold finished bars.

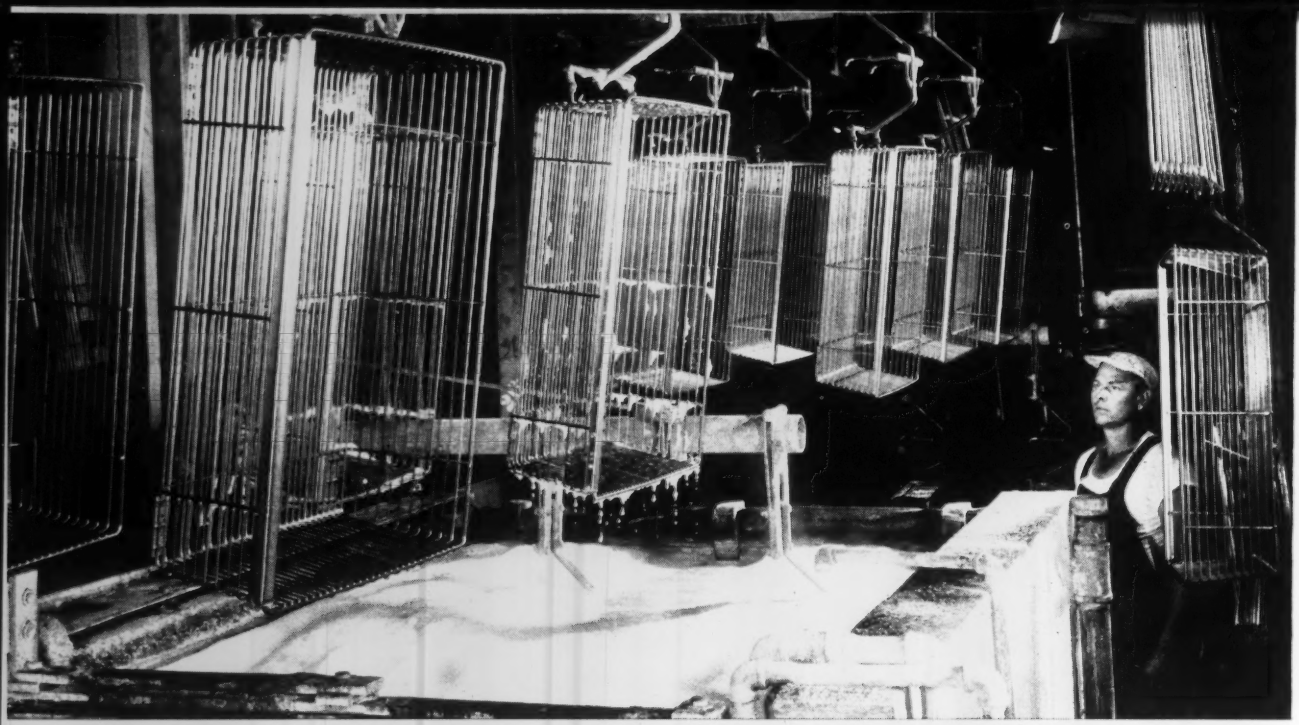
You can see the difference. You can work the difference advantageously. Since you pay nothing extra for B&L Lusterized bars, it is always rewarding for you to specify "Bliss & Laughlin Lusterized."

Originators of LUSTERIZED® Finish—The BIG DIFFERENCE in Cold Drawn Bar Steel

BLISS & LAUGHLIN

GENERAL OFFICES: Harvey, Ill. • PLANTS: Harvey, Detroit, Buffalo, Mansfield, Mass.

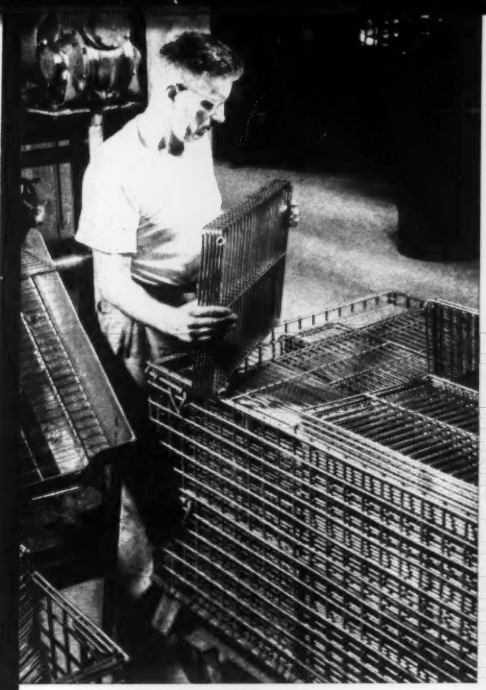
Specialists in Finish, Accuracy, Straightness, Strength and Machinability



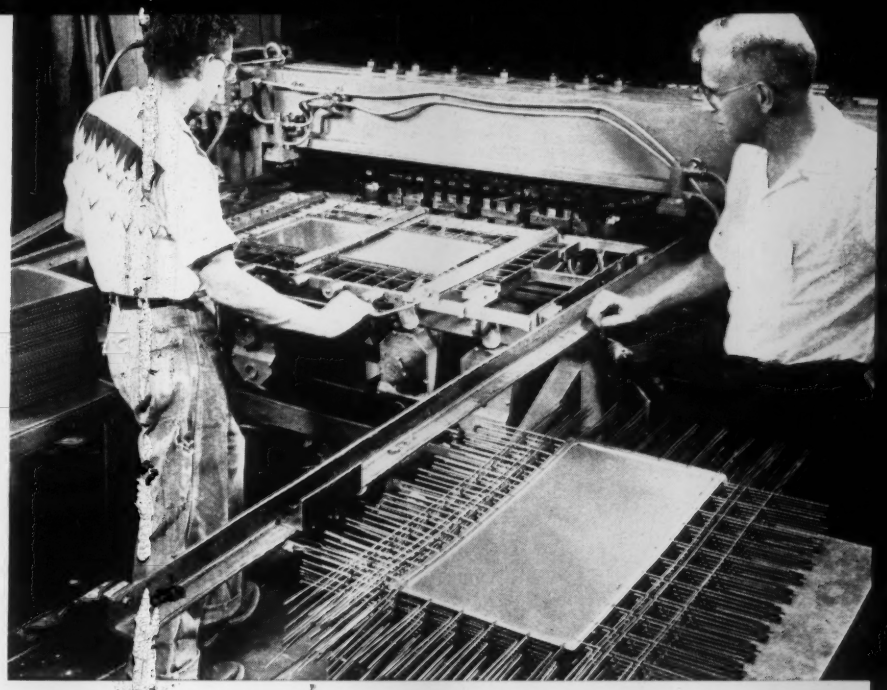
Baskets for a combination refrigerator-freezer enter plating line on conveyor. They are shown here leaving the first bath, an alkaline cleaner, and moving to a clear water rinse. A total of 15 immersions are given these baskets in the process of plating them with a .0005 inch coating of zinc. Below: The excellent surface required for plating is shown in the Pittsburgh Steel wire stockpiled at Bauer Bros. Co. in its Springfield, Ohio, wire division.

Bauer Bros. Gets Extra Clean Wire For Fully Automated Plating Lines

Defect-free Finish of Pittsburgh Steel Co. Wire Eliminates Costly Surface Preparation



This machine was designed and built by Bauer Bros. own personnel to speed the efficient production of racks, seen here coming off the end of the unit.



On this automatic multi-welder, design-specified by William Cannell, right, Bauer Bros. Co. master mechanic, a total of 288 different combinations of welds can be made. Here the operator is welding wire to a solid bottom basket for use by a major appliance manufacturer.

Bauer Bros. Co. demands, and gets, from Pittsburgh Steel Company extra smooth, clean, bright wire which can go into plating lines without any expensive surface preparation.

This is only possible with wire that has an extremely clean, defect-free surface.

Bauer Bros. Co. keeps its Springfield, Ohio, plant's automated plating line running smoothly with consistently excellent results.

The Wire Division of Bauer Bros. Co. fabricates wire shelves, racks and baskets for refrigerators, freezers, ovens and other appliances made by virtually every major appliance manufacturer.

Bauer Bros. buys coils of wire which it cuts into proper lengths, straightens and then forms into finished products on automatic shaping and welding machines, many of which were designed by Bauer Bros. personnel.

On these machines, Pittsburgh Steel's bright basic wire gets its first test. Good grain structure gives the wire ability to take severe bending without ripping or tearing. Uniform hardness from coil to coil and from shipment to shipment speeds production and holds down rejects.

• **Meets Customer's Demands**—On a completely automated plating line, Pittsburgh Steel wire meets Bauer Bros. demands for freedom from pits, seams and porosity.

So, Pittsburgh Steel wire helps Bauer Bros. Co. two ways:

1. **More economical production** on automatic machines and on plating lines.

2. **Improved appearance** of the final product adds to salability.

Bauer Bros. Co. can plate its wire products with any of these coatings:

A combination of copper, nickel and chrome, zinc, clear or colored lacquer, and plastic (the new Corvel Fusion Bond process).

Products come to the plating line on an overhead conveyor directly from the Fabrication Department. Without any stops, the conveyor immerses products in a series of tanks on the plating line. In zinc plating, pictured here, baskets are dipped in a total of 3 tanks without a halt and without the intervention of a human hand. Drying and baking complete the plating cycle.

On these baskets, destined for use in a new combination refrigerator-freezer made by one of the country's largest appliance manufacturers, the zinc coating never falls below .0005 inch.

After plating, coatings are laboratory checked for porosity, density and resistance to wear and corrosion. In one test, products are enclosed in a salt air immersion chamber where temperature is maintained at 100 degrees F. and humidity at a sweltering 100 percent. A five percent salt solution gives the zinc a rugged workout.

Standards like these, rigidly maintained, call for the best in wire. The wire must be the ultimate in cleanliness, smoothness and uniformity. Pittsburgh Steel wire meets these specifications day in and day out.

Like Bauer Bros. Co., you also can get production economies and a more salable product from the use of Pittsburgh Steel's basic wire. Whatever you make from any type of manufacturers wire—from nails to precision springs—let a Pittsburgh Steel representative show you what Pittsburgh Steel quality and service can do for you. You can start benefiting today by getting in touch with the nearest district sales office.

Pittsburgh Steel Company

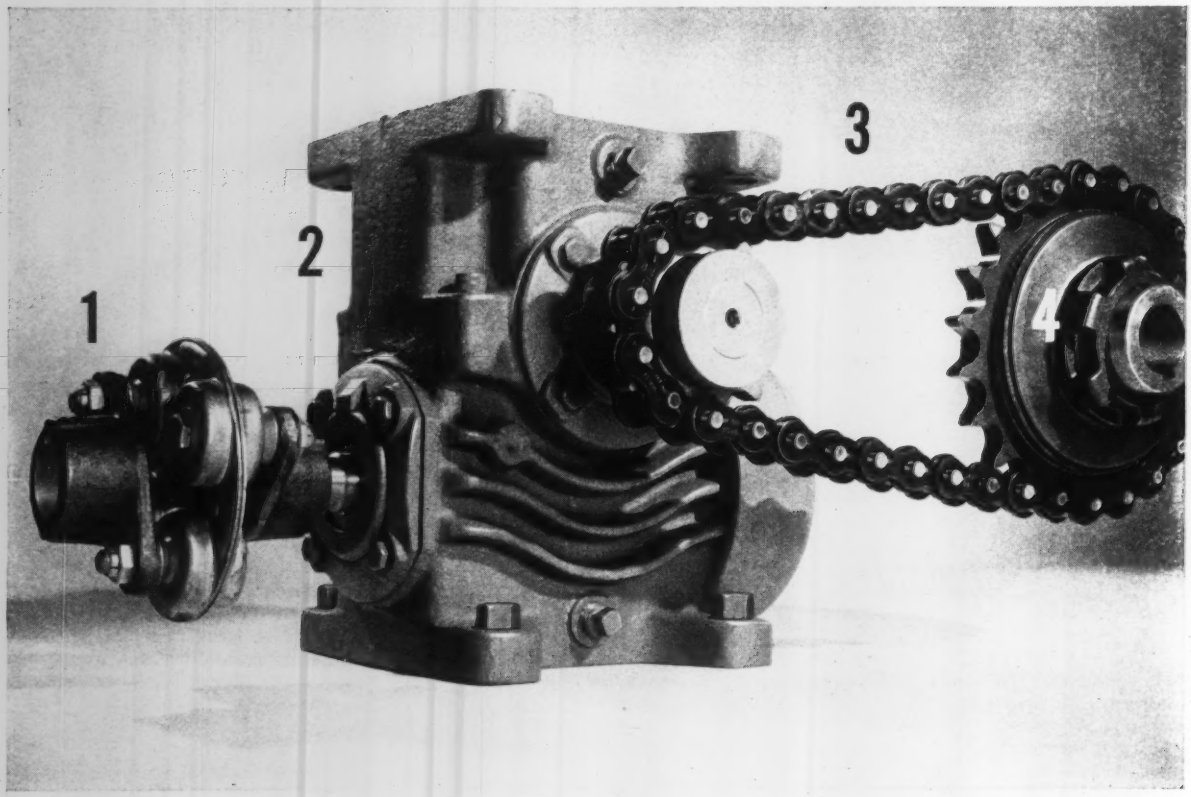
Grant Building • Pittsburgh 30, Pa.

District Sales Offices

Atlanta	Cleveland	Dayton	Los Angeles	Pittsburgh
Chicago	Dallas	Detroit	New York	Tulsa
		Houston	Philadelphia	Warren, Ohio

Nobody gives you as complete power transmission service as Morse, because . . .

Only Morse offers all four of these basic power transmission components



1 Couplings*

Morflex
Flexible Chain
Radial
Nylon
(*All available in driveshaft constructions)

2 Eberhardt-Denver Speed Reducers

PoweRgear®
Worm Gear
Helical
Gearmotors

3 Chain and "Timing"® Belt Drives

Roller Chain
Silent Chain
Hy-Vo® Drives
"Timing" Belt

4 Clutches

Torque Limiter
Cam
Overcenter
Pullmore

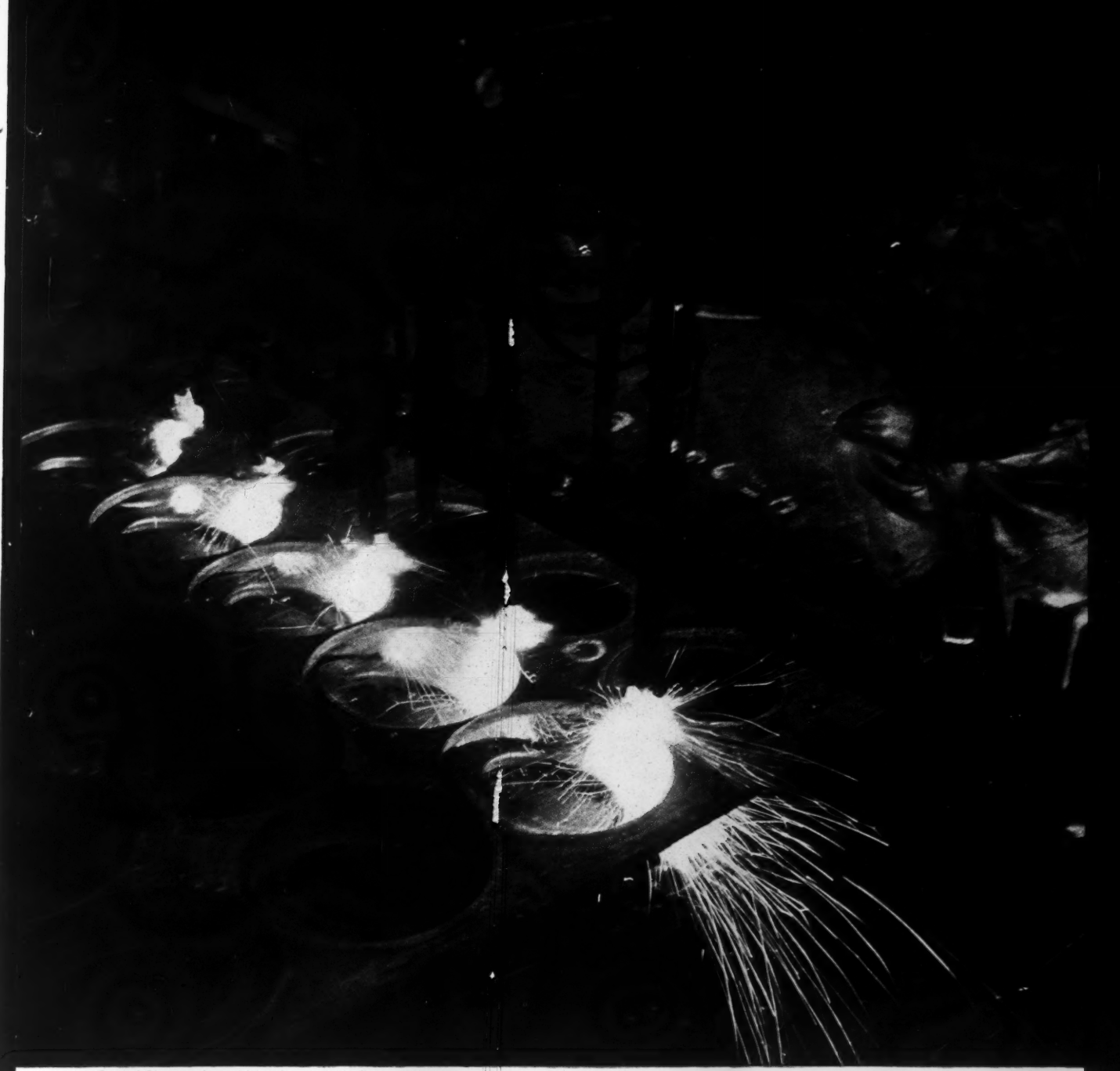
IN POWER TRANSMISSION THE TOUGH JOBS COME TO

MORSE MORSE B-W BORG-WARNER *

*Trademark

REMEMBER: The toughest jobs in power transmission come to Morse, because *only Morse* offers all four of these basic components . . . and backs them up with technical know-how based on over 60 years' experience solving power transmission problems.

MORSE CHAIN COMPANY, A BORG-WARNER INDUSTRY, Dept. 2-108. ITHACA, NEW YORK. Export Sales: Borg-Warner International, Chicago 3, Illinois



One of Claymont's multi-torch automatic flame-cutters.

by d'Arazien

Main feature of the Claymont story is integration. For instance, consider one phase of our operation—the new Fabrication Shop. First, steel from Claymont's own open hearth is formed into plate on Claymont's own rolling mills and sent to the Fabrication Shop. Here, modern equipment welds, shears, presses, rolls, cuts or machines the plate to produce fabricated products for many industries.

CLAYMONT
FABRICATED STEEL PRODUCTS

CF&I

CHECK CLAYMONT FOR—Alloy Steel Plates • Carbon Steel Plates • Stainless-Clad Steel Plates High Strength Low Alloy Steel Plates • CF&I Lectro-Clad Nickel Plated Steel Plates • Pressed and Spun Steel Heads • Manhole Fittings and Covers • Fabricated Steel Products Large Diameter Welded Steel Pipe

PRODUCTS OF WICKWIRE SPENCER STEEL DIVISION • THE COLORADO FUEL AND IRON CORPORATION

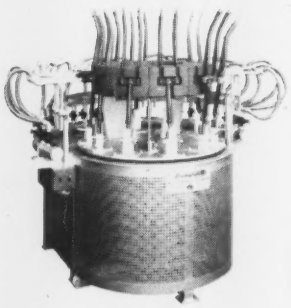
Plant at Claymont, Delaware • Sales Offices in all Key Cities

5787

Columbia produces 250 bicycle forks per hour with automatic GAS brazing

Gas brazing is not new to Westfield, where Columbia bicycle frames have been brazed with Gas-fired Selas processing equipment for many years. During this time, pre-placing of brass filler material and automatic heating have limited dependence on operator skill, reduced material waste, and eliminated costly cleanup operations. With the installation of the new Gas brazing machine in their production operation, these advantages have been extended to include fork manufacture, also.

For information on how Gas equipment can help you in your production operations, call your Gas Company's industrial specialist. He'll be glad to discuss the economics and outstanding results you'll get with Gas and modern Gas equipment. *American Gas Association.*



Two fork styles in all standard bicycle sizes are joined from eight steel components on this new automatic Selas machine by Westfield Manufacturing Co., Westfield, Mass. Controlled combustion and flame geometry bring the parts to brazing temperature of 1750°F in only 86 seconds, using economical Gas equipment.

WASHBURN
Phosphate Coated
MUSIC WIRE

. . . especially merits your careful investigation if you are interested in superior uniformity of PHYSICALS. This wire amazes the Spring Manufacturer when he tries it on his most difficult jobs.

A trial order will convince you.

108

WASHBURN WIRE COMPANY NEW YORK CITY

WASHBURN

CLEAN, UNIFORM BILLETS – STRIP – RECTANGULAR, ROUND, FLAT RODS
TEMPERED AND UNTEMPERED FLAT AND ROUND HIGH CARBON WIRES

John E. Gibbons, Vice President, King Fifth Wheel Co., tells . . .

Why we chose General Electric to vacuum-melt the super alloy for these jet engine parts

"King Fifth Wheel cold-forms rectangular bar stock into rings for after-burner sections, rear frames, and other jet engine parts. We were using René 41,* the strongest vacuum-melted high-temperature alloy that can be formed, forged, and welded.

"But, we were running into trouble in the rolling operation. And rejects were raising cain with our delivery schedule. So we called in another supplier, General Electric – the original developer of René 41 vacuum-melted alloy.

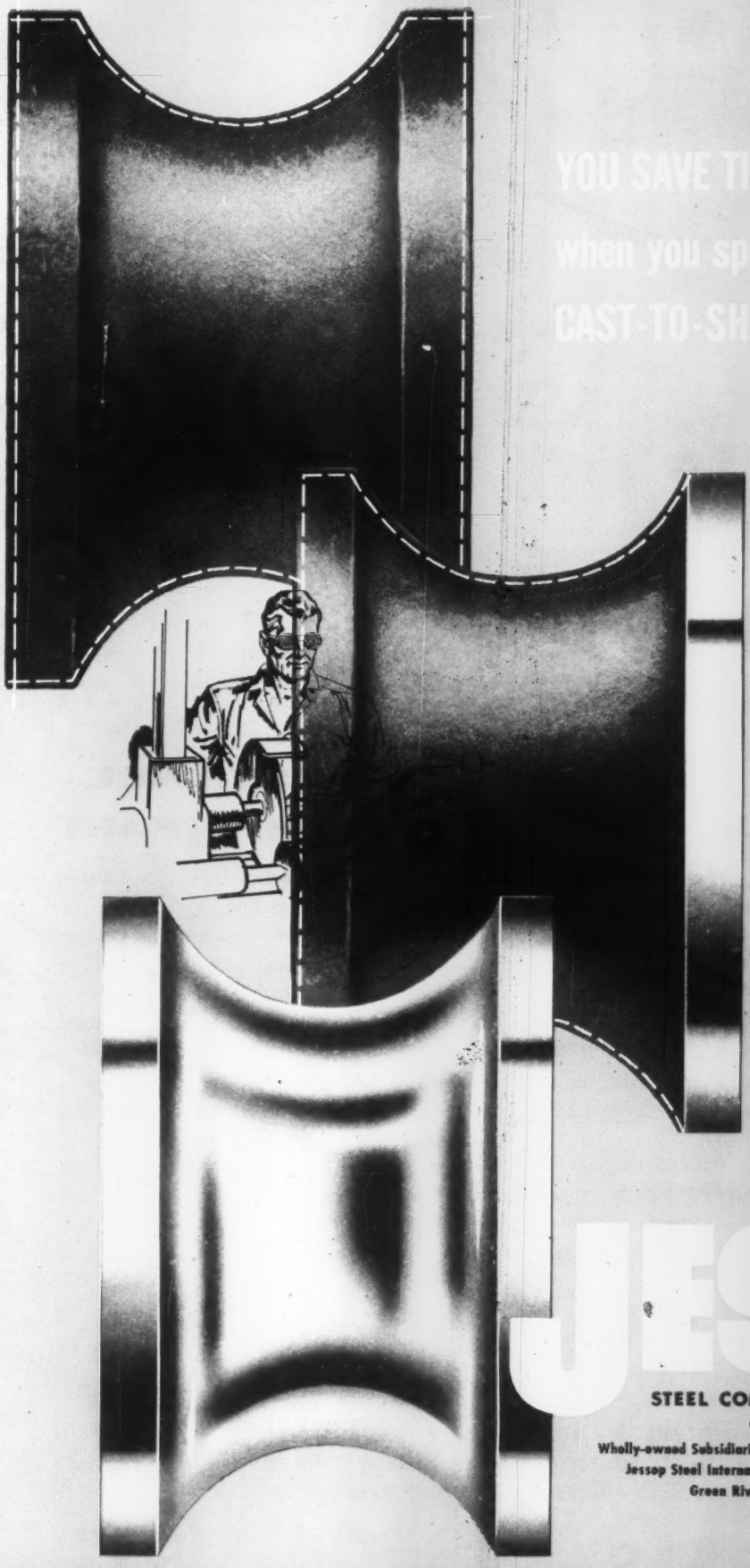
"G.E. supplied us with material of consistently high quality. And, their engineers worked closely with us to help iron out fabrication problems. Today, thanks to the General Electric vacuum-melting service, we've cut rejects to a minimum . . . and we're making on-time deliveries of a top quality product."

Whatever vacuum-melted alloy your specifications call for, you too can profit from G.E.'s experience and technical know-how in the field of high-temperature alloys. For facts about G.E.'s vacuum-melting and engineering services, write: *Metallurgical Products Department of General Electric Company, 11141 E. 8 Mile Ave., Detroit 32, Michigan.*

*Trademark of the General Electric Co.

Progress Is Our Most Important Product

GENERAL ELECTRIC



YOU SAVE TIME AND MONEY when you specify JESSOP CAST-TO-SHAPE TOOL STEEL

If you use dies, forming tools, gauges, cams, forming rolls or other similar products in your production, chances are you will profit by using cast-to-shape tool steels. By comparison with forged blanks, you will buy less metal and save time, labor and machining cost. These are the advantages inherent to the system of casting tool steel to the pattern of ultimate use.

But Jessop, as a company, offers many other advantages. Jessop's foundry is small and compact as are its melting facilities, and the team that runs it is highly skilled and experienced and backed up by the most modern and well equipped of chemical and metallurgical labs. This means close tolerances, accurate analysis plus delivery speed. When you need good tool steel castings fast, you can depend on Jessop. Write for our cast-to-shape catalog.

District Offices

Birmingham, Ala.
Buffalo, N. Y.
Charlotte, N. C.
Chicago, Ill.
Cincinnati, Ohio
Cleveland, Ohio
Detroit, Mich.
Hartford, Conn.
Houston, Tex.
Indianapolis, Ind.
Los Angeles, Calif.
Montreal, Quebec
New York, N. Y.
Philadelphia, Pa.
Pittsburgh, Pa.
Toledo, Ohio
Toronto, Ontario
Wallaceburg, Ontario
Washington, D. C.

Representatives

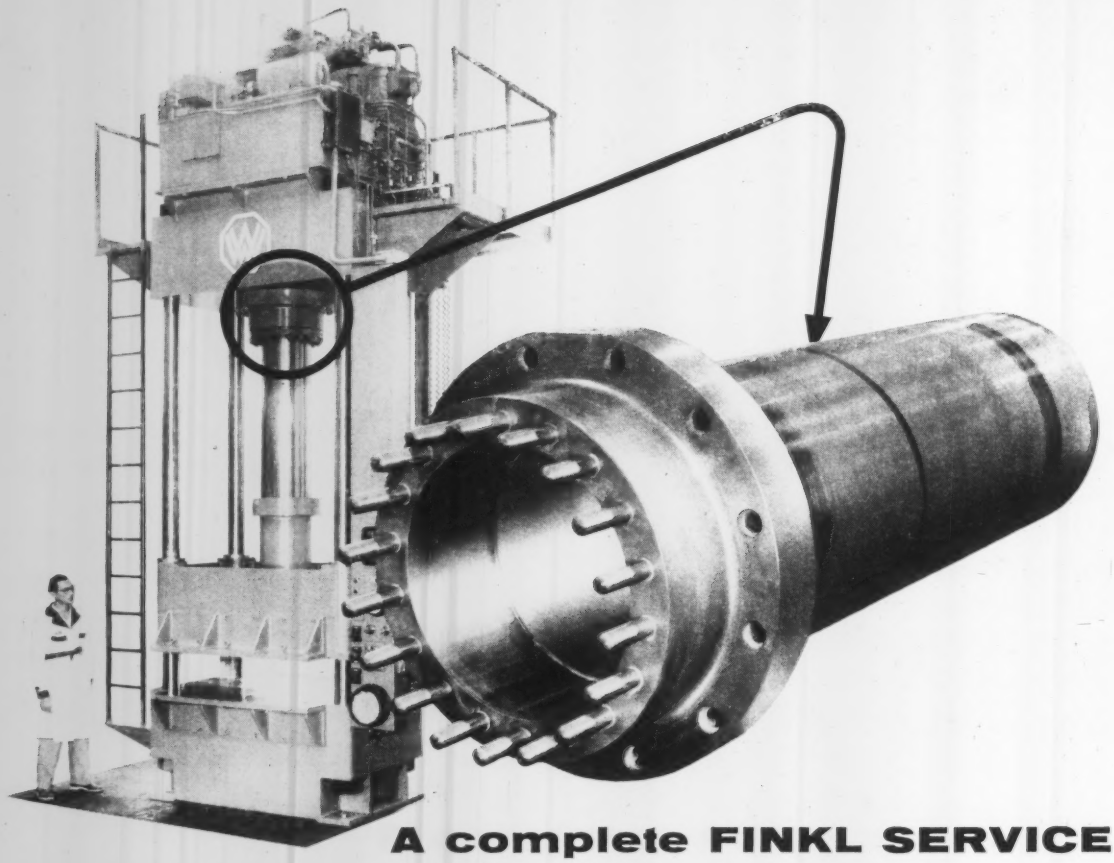
Dayton, Ohio
Denver, Colo.
Kansas City, Mo.
Milwaukee, Wis.
Phoenix, Ariz.
St. Louis, Mo.
Utica, N. Y.

JESSOP

STEEL COMPANY · WASHINGTON, PA.

OFFICES IN PRINCIPAL CITIES

Wholly-owned Subsidiaries: Jessop Steel of Canada Limited, Wallaceburg, Toronto
Jessop Steel International Corp., Chrysler Building, New York, New York
Green River Steel Corporation, Owensboro, Kentucky



A complete FINKL SERVICE - FROM BLUEPRINT TO FINISHED PART

Many companies profit from Finkl's complete package service on finished machine parts. Williams-White & Company of Moline, Illinois, manufacturers of heavy machinery, called on Finkl for the forged steel, main cylinder shown above. It is used on a 300 ton plastic molding press employed for pilot molding procedures prior to production molding runs.

The entire cylinder was handled in our plant. Made of C-1035 steel from our electric furnace melt shop, the part was forged, heat treated, rough and finished machined under one roof. The 17″ bore was ground to $\frac{+.003''}{-.000''}$. Final dimensions, as delivered and installed, were 6′-1″ long with the main body 22″ in diameter.

With modern equipment and skilled craftsman, we do jobs both larger and smaller than the cylinder shown. The important thing is we do all of them well. Next time you are planning a machine part call a Finkl engineer and learn how you can profit by having it done under one roof.

DIE BLOCKS · FORGINGS · HOT WORK STEELS · ELECTRIC FURNACE STEELS

A. Finkl & Sons Co.

2011 SOUTHPORT AVE · CHICAGO 14, ILLINOIS

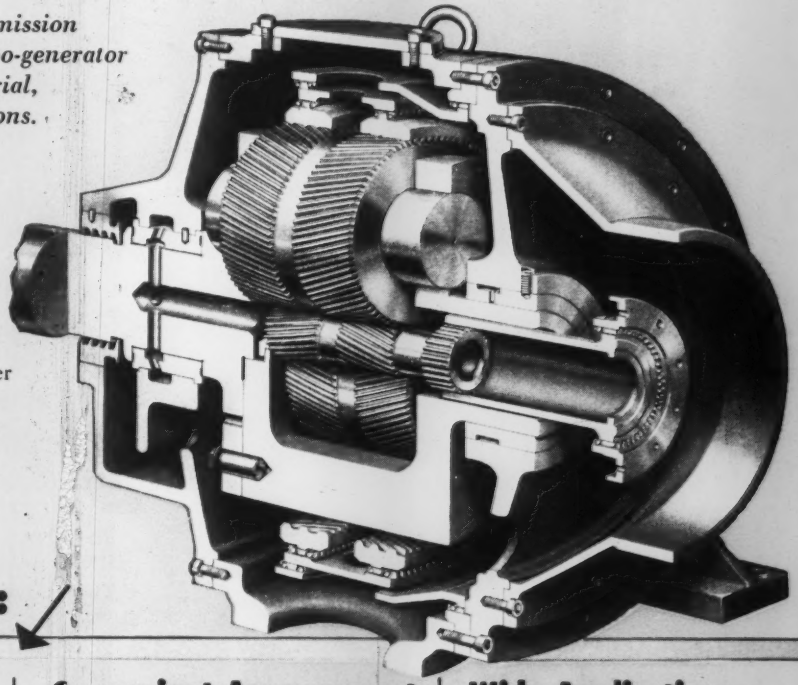
Offices in: DETROIT • CLEVELAND • PITTSBURGH • INDIANAPOLIS • HOUSTON • ALLENTOWN • ST. PAUL
COLORADO SPRINGS • SAN FRANCISCO • SEATTLE • BIRMINGHAM • KANSAS CITY • BOSTON • LOS ANGELES
Warehouses in: CHICAGO • DETROIT • BOSTON • LOS ANGELES

DE LAVAL-STOECKICHT
PLANETARY GEAR

...for high speeds...high horsepower

Proved in hundreds of installations abroad totalling over 3,000,000 horsepower—now available in America!

For all high torque power transmission applications such as pump turbo-generator and compressor drives in industrial, municipal and marine installations.

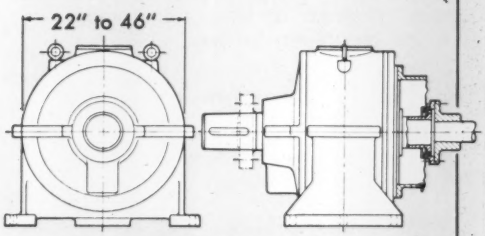


This cutaway view of the De Laval-Stoeckicht Planetary Gear shows how it provides flexibility for proper load distribution throughout the gear members. The thoroughly proved and tested design is completely reliable in transmitting high horsepower for high speed applications. • Highest efficiencies (98% or higher)...no high speed bearings...less friction losses.

Check These Advantages:

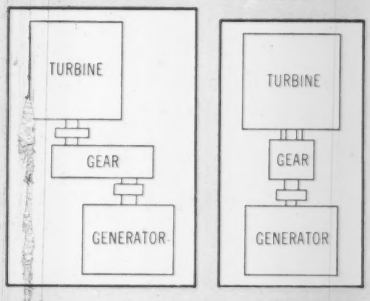
Small Size—Light Weight

Compact—low weight per hp. Sizes range from 22" to 46" in diameter, depending on horsepower requirements. Example: 5000 hp planetary unit weighs 1700 lbs. against 6000 lbs. for conventional gear.



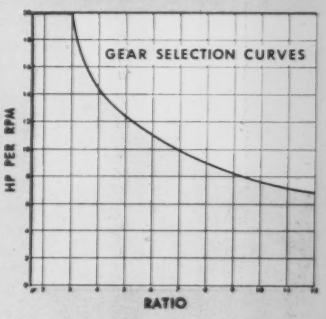
Convenient Arrangement

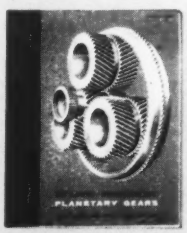
Co-axial or "in-line" arrangement of gear members takes up far less space than parallel axis gears of equivalent horsepower rating.



Wide Application

Capacity range shown in shaded area on chart below. For other applications, contact your De Laval Sales Engineer.





For further details, write for Bulletin 2400.

DE LAVAL *Steam Turbine Company*

860 Nottingham Way, Trenton 2, New Jersey

DL431

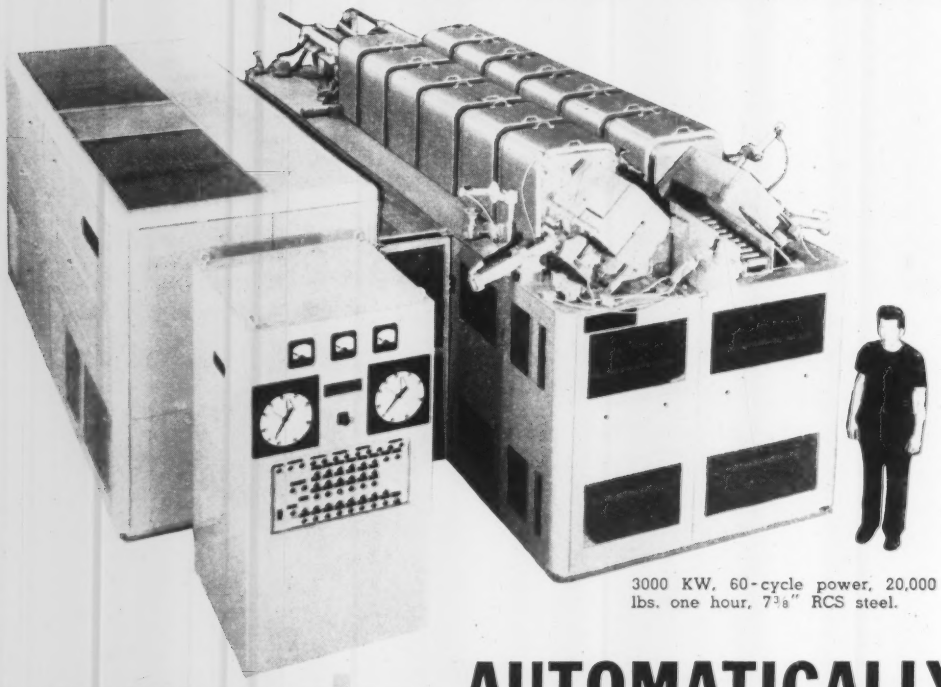
FORGING HEATERS

THAT

START

STOP

AND HOLD



3000 KW, 60-cycle power, 20,000 lbs. one hour, 7 3/8" RCS steel.

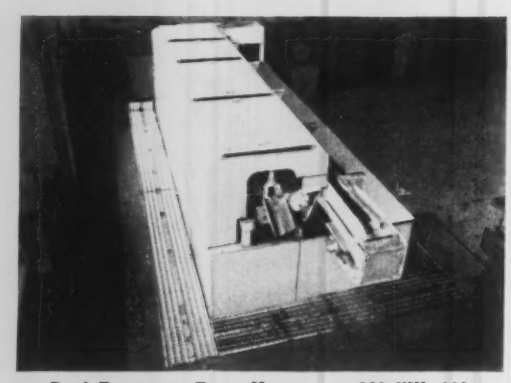
AUTOMATICALLY

These induction heaters for steel forging billets differ from any forge billet heaters ever built.

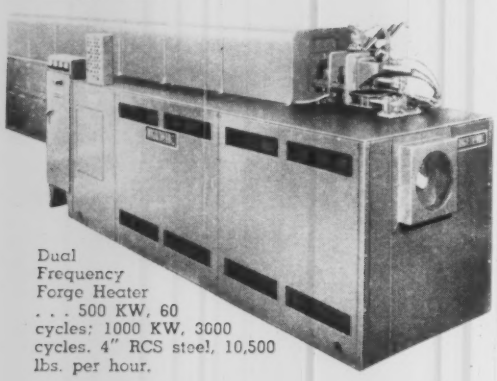
- They are empty at the start—using only two or three dummy billets.
- They have an automatic clean-out—heats are easily segregated.
- They hold at the proper temperature and have automatic voltage regulation.

The heaters keep pace with the press . . . no need of building up a stockpile of heated billets. Completely automatic, the "Magnethermics" eliminate guesswork and deliver a billet at the proper temperature every time.

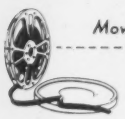
Magnethermic's engineers have studied forge shop practice for a good many years. If you are considering a modernization program in your forge shop, write Magnethermic for recommendations.



Dual Frequency Forge Heater . . . 500 KW, 960 cycle; 500 KW, 60 cycle. 2" - 4" RCS steel, 6000 lbs. per hour.



Dual Frequency Forge Heater . . . 500 KW, 60 cycles; 1000 KW, 3000 cycles. 4" RCS steel, 10,500 lbs. per hour.



Movie Available on These Automatic Forging Heaters

16 mm, color; shows the complete cycle of operation. Write to Magnethermic and advise when you would like a showing.

MAGNETHERMIC®
CORPORATION
3990 SIMON RD. • YOUNGSTOWN 7, OHIO

Stainless Steel spinning information:

*Before you take a spin—check the oil

Stainless Steels lend themselves readily to cold spinning. When you spin Stainless Steel, be especially generous with the lubricant. Use lubricants with sufficient body to withstand the high pressures and temperatures that may develop. Because of Stainless Steel's superior toughness, greater pressure is required than that used for carbon steel. A good spinning tool is made of hardened alloy steel. It should have a large bearing surface to distribute the pressure as widely as possible.

Spinning Stainless Steel will give you accurate and uniform wall thickness in one operation not readily obtainable in drawing. Certain shapes can be spun more economically than drawn, which may require several operations and heat treatment. Remember, too, that certain types of steel are more adaptable to spinning than drawing.

You'll find that Stainless Steel isn't difficult to spin, it's just different. You can do a top-notch job with ease when you follow our 130-page manual. If you haven't received your free copy, write on your company letterhead for our "Stainless Steel Fabrication Book," United States Steel, 525 William Penn Place, Pittsburgh 30, Pa. *USS is a registered trademark*

United States Steel Corporation – Pittsburgh
American Steel & Wire – Cleveland
National Tube – Pittsburgh
Columbia-Geneva Steel – San Francisco
Tennessee Coal & Iron – Fairfield, Alabama
United States Steel Supply – Steel Service Centers
United States Steel Export Company

USS United States Steel

100% FINANCING

for your new plant

...and at low, low interest rates!

Communities in our service area are prepared to roll out the red carpet for desirable industry to the extent of *totally financing* construction of the plant.

It's a unique plan for lease purchasing that combines funds from non-profit community development corporations and the Pennsylvania Industrial Development Authority with first mortgages through private lending institutions.

West Penn Power is prepared to obtain information for you, in strict anonymity, about communities participating in this plan and, in addition, provide specific information on many other plant location factors to assist in your evaluation of WESTern PENNsylvania as a desirable location.

W E S T P E N N P O W E R

an operating unit of the WEST PENN ELECTRIC SYSTEM

Hello...

I'm Charlie Fife . . . of course every plant must have 100% financing of some kind; but, I'm sure you'll agree that this unique plan can solve a lot of problems, providing others, equally important, can be worked out as well.

Labor supply, for example. We have communities with excellent labor pools, both male and female, on which new industry can draw. But are the needed skills available at the right wage scale? Facts, figures and skill surveys from our files can tell you.

Because these problems are complex, West Penn Power maintains a staff of plant location specialists to assist in your evaluations. There is no charge for this professional service, of course . . . and you may be sure your confidence will be respected. Write today.

CHARLES M. FIFE, *Manager*
Area Development Department

WESTern PENNsylvania

WEST PENN POWER, Area Development Department, Cabin Hill, Greensburg, Pennsylvania S-2

Yes, I'm interested in WESTern PENNsylvania:

☐ Please contact me in strict confidence. ☐ Please send booklet, "Plant Location Services."

Name _____ Title _____

Company _____ Street _____

City _____ Zone _____ State _____

100,000,000 PRECISION MADE RIVETS A YEAR

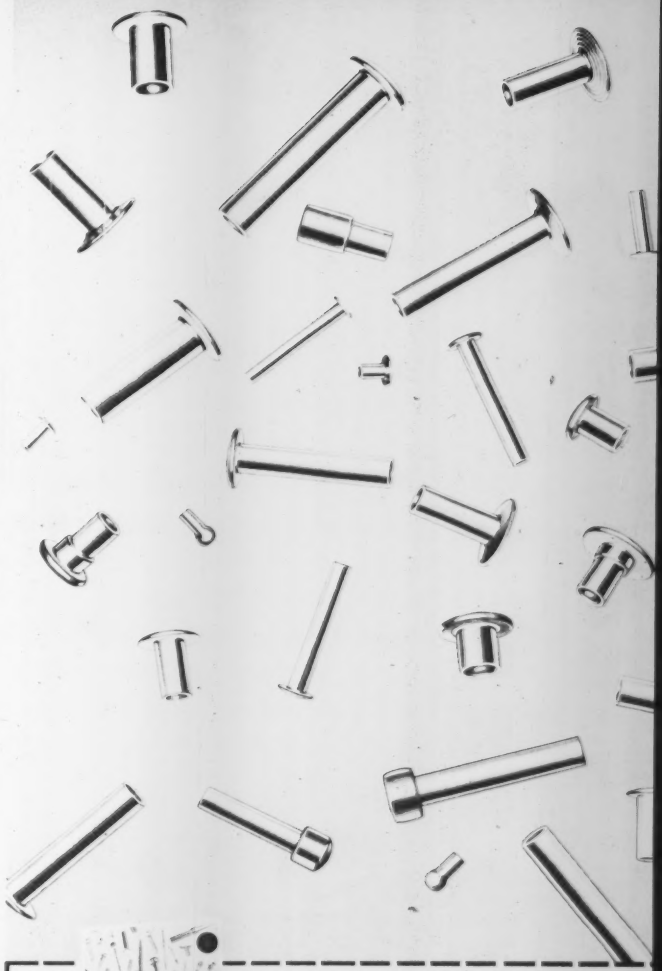
KEYSTONE EXTRUDED TUBULAR RIVET WIRE STUDY

TROJAN RIVET

Trojan Rivet picks

KEYSTONE WIRE

for consistent quality and less trouble



100,000,000 high quality rivets a year prove Keystone extruded tubular rivet wire really makes a difference! George Merta, President of Trojan Rivet Corporation, Glendale, Calif., says, "We have been in the rivet business for seven years and switched to Keystone about three years ago. When the first Keystone Wire arrived, everybody immediately took to it: the operators liked it, it saved on tools and gave less trouble. We just set up the machines and forget it. Our dies last 25% longer and there are virtually no rejects."

Flowability is the secret—The superior flow qualities of Keystone extruded tubular rivet wire starts with carefully selected raw materials and embodies special methods of wire making and thermal treatments developed exclusively in Keystone research laboratories. Our metallurgical staff and facilities are available to you.

Keystone Steel & Wire Company, Peoria 7, Illinois

KEYSTONE

WIRE FOR INDUSTRY

Keystone Steel & Wire Company
Peoria 7, Illinois

COLD HEADING FACTS FOLDER . . . send coupon today! New folder discusses uses, applications, methods, technical facts, wire requirements.

Name_____ Title_____

Company_____

Street_____

City_____ State_____

YALE outperforms any loader—handles 25% more material every hour...Field tests prove it!

EXTRA WORK PER HOUR. No matter what bulk you handle, you'll get more productive work at less cost with the new Yale Industrial Tractor Shovel. *It carries more*—full 2500-lb. bucket capacity. *It moves faster*—accelerates to operating speed of 8 mph in 3.5 seconds—to 13 mph in 5.5 seconds. Exclusive Yale Torque Transmission (fully automatic) permits quicker, smoother starting, eliminates shifting, provides more power under load conditions—speeds cycle operations. Gasoline or LP-Gas.

EXTRA SAFETY. Yale's exclusive Safety-Curve Arms assure extra-safe elbow room—extra visibility when bucket is raised.

EXTRA MANEUVERABILITY. This is the first tractor shovel designed especially for *industrial* use. It's *compact*—only 117" overall length—can maneuver in any aisle wide enough for a wheelbarrow.

EXTRA LOADING AND DUMPING FEATURES. Yale's exclusive 45° ground-level tipback insures the ultimate in loading action—and a grade-level carrying position to minimize spillage. Exclusive 6' dumping clearance is the highest on any model of similar wheelbase. Bucket is automatically self-locating—lowers from full dump-position to ground-level. Bucket automatically returns to digging position.

For a demonstration in your plant or for actual case histories, write to The Yale & Towne Manufacturing Co., Philadelphia, Pa., Dept. A-810.

COMPARE!

For only 3¢ more per hour* the Yale Industrial Tractor Shovel offers these exclusive features

- Exclusive Yale Torque Transmission (fully automatic)
- Exclusive 45° ground-level bucket tipback
- Exclusive Safety-Curve Arms
- Exclusive accelerating speed of 8 mph in 3.5 sec.
- Exclusive sealed brakes
- Exclusive forward and rear operating lights
- Exclusive 6' dumping clearance

*Based on comparative initial costs depreciated over 10,000 working hours.

YALE* *REG. U.S. PAT. OFF

YALE & TOWNE

INDUSTRIAL LIFT TRUCKS & TRACTOR SHOVELS • HOISTS

GASOLINE, ELECTRIC, DIESEL & LP-GAS INDUSTRIAL LIFT TRUCKS • WORKSAVERS
WAREHOUSERS • HAND TRUCKS • INDUSTRIAL TRACTOR SHOVELS • HAND AND ELECTRIC HOISTS

YALE MATERIALS HANDLING DIVISION, THE YALE & TOWNE MANUFACTURING CO. MANUFACTURING PLANTS: PHILADELPHIA, PA.; SAN LEANDRO, CALIF.; FORREST CITY, ARK.

Weldynamics

ARC WELDING AT WORK CUTTING COSTS

Completely automatic welding.. guided by hand with the "Mechanized Squirt We der"

Here's how you can get the speed and sureness of aut matic welding . . . plus portability and versatility never efore heard of in submerged arc welding.

Mechanized gun is propelled at any preset speed whil elec-trode and flux are fed from an all day supply on the co pact, portable control unit.

- Accurately controlled speeds from 1 to 70 inches per minute.
- Flux and wire supplies allow many hours of continuous welding.
- Guides in any direction without fixtures.
- Deep penetration of submerged arc welding.
- Easy to make beautiful welds.
- High operator appeal—light gun, no helmet.

TRIGGER — *Single trigger starts and stops flux flow, wire feed, and welding current.*

SPEED CONTROL AND REVERSING SWITCH — *Speed control dial calibrated in inches per minute. Can be changed while welding. Reversing switch determines direction of travel.*

TRAVEL MOTOR AND DRIVE WHEEL — *Propels gun in any direction at desired speed.*

MOTOR MOUNT — *Travel motor easily adjusted up or down to control flux coverage and rotated around the gun to change travel direction. Control wire coupling disconnects for quick removal of entire travel mechanism for manual operation.*

FLUX — *Granular flux feeds through tube from tank on control unit to small reservoir on gun. Flows from gun by gravity as needed.*

ELECTRODE — (5/32" or 3/64") — *Feeds continuously from 60 lb. coil in control unit through extra flexible cable.*

PORTABLE CONTROL UNIT (*not shown*) — *Contains arc voltage and inching speed controls as well as meters for welding current and voltage. Unit also mounts 60 lb. coil of electrode and tank for over 100 lbs. of flux. Entire control system operates on 115 volt AC power.*

The World's Largest Manufacturer of Arc Welding Equipmen

LINCOLN

© 1958 The Lincoln Electric Company

THE LINCOLN ELECTRIC COMPANY, DEPT. 1645 CLEVELAND 17, OHIO

ARISTOLOY

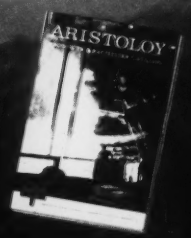
Electric Furnace Steels

LEADED—Electric Furnace 52100 • Electric Furnace Alloy • Electric Furnace Carbon • Alloy Base Alloy • Alloy Base Carbon.

STAINLESS—300 Series • 400 Series • 500 Series.

FURNISHED AS—Hot Rolled Blooms, Billets & Bars • Hot Rolled, Annealed & Heat Treated • Ground Blooms & Billets • Bars—Hot Rolled; Turned; Turned, Ground & Polished; or Cold Drawn with or without Heat Treatment.

BEARING QUALITY • AIRCRAFT • PISTON PIN QUALITY • ELECTRIC FURNACE ALLOY • ELECTRIC FURNACE CARBON • ALLOY BASE ALLOY • ALLOY BASE CARBON



NEW PRODUCTS & FACILITIES CATALOG
Describes melting, rolling, thermal treating and finishing capacity of Copperweld's Aristoloy Steel Division. Complete product listing for Aristoloy carbon, alloy, stainless, leaded and nitriding steels. Send for your copy today.

ARISTOLOY STEELS

COPPERWELD STEEL COMPANY

ARISTOLOY STEEL DIVISION • 4005 Mahoning Ave., Warren, Ohio • EXPORT: Copperweld Steel International Co., 225 Broadway, New York 7, N. Y.

STEEL
October 20, 1958

Metalworking Outlook

FRB Watches Inventory Buildups

Watch for the gross national product to hit a record annual rate in the fourth quarter. The performance in 1958's last three months will reach $450 billion, to exceed the previous high of $446 billion, set in last year's third quarter. This year's third period rate was $440 billion. Industrial production got on the mark to start its last quarter sprint in September with a seasonally adjusted 1[illegible]7 per cent of the 1947-49 average. The Federal Reserve Board reports that was one point above the revised August total. Tighter money may be in the offing if the economy goes too fast. The FRB is particularly watching inventory buildups and will act if they approach the rate begun in late 1954. From then until mid-1957, we produced more than we consumed, contributing to the rapid dip of late 1957 and much of 1958.

Unemployment To Be Fairly High

Despite optimism about the economy, we're still going to have relatively high unemployment, FRB analysts think. That's because productivity has increased considerably as we come out of the recession. Continued cost reduction by industry will tend to hold up unemployment figures next year.

But Skilled Men Will Be Hard To Find

But employment will rise, although not at a pace equal to the quickening in industrial production. Manpower Inc., the temporary help service firm, points out that 24 per cent of the respondents to its survey expect to increase their employment. Only 7 per cent expect a drop. Significance: Keep your skilled categories at strength. The semiskilled and unskilled jobs should present no problem.

Local Fights Delay Aut[illegible] Peace

Count on a rapid solution to most of the local strikes among the Big Three auto plants. For the first time since it began assembling 1959 models in mid-August, Chrysler Corp. operated normally last week. Ford Motor Co. is getting back on the track, but General Motors Corp. has the worst problems—90 of its 116 plants were struck last week. The expected ratification of GM's national agreement today should clear up the majority of the local walkouts.

Right-To-Work Prospects Dim?

Right-to-work will pass "in less than half" of the six states (Ohio, California, Colorado, Idaho, Kansas, Washington) voting Nov. 4 on laws to ban the union shop, predicts a Chamber of Commerce spokesman. Defeat in either Ohio or California will cripple the whole movement, he claims. Labor is

Metal Show Section—Page 157 Market Outlook—Page 293

lavishly spending money and manpower in those two states to whip the measures. The lesson, says the chamber: Management needs more political education.

More Space Probes Planned into '60

The Air Force will get another chance at a lunar probe about Nov. 8. The Army's chance will come later this year. It'll use a Jupiter instead of a Thor as the first stage. Space scientists are stumping for probes at Venus next year, Mars in 1960. They would probably involve the Atlas as a first stage. To get the money, they'll have to put much pressure on the National Aeronautics & Space Agency.

Shortage Looms in Tech Executives

Get set now to cope with greater needs for scientific-technical executives, says Hoff, Canny, Bowen & Associates Inc., New York placement firm. The boom of the 1960s will increase the requirements, particularly in mechanical engineering, industrial engineering, and chemistry. Some 78 per cent of the companies surveyed find scientific-technical men weak in administrative skills. The areas offering the greatest employment opportunities are the Midwest, New Jersey, New York, Pennsylvania, the western seaboard, and the prairie states.

Gas Transmission on the Move

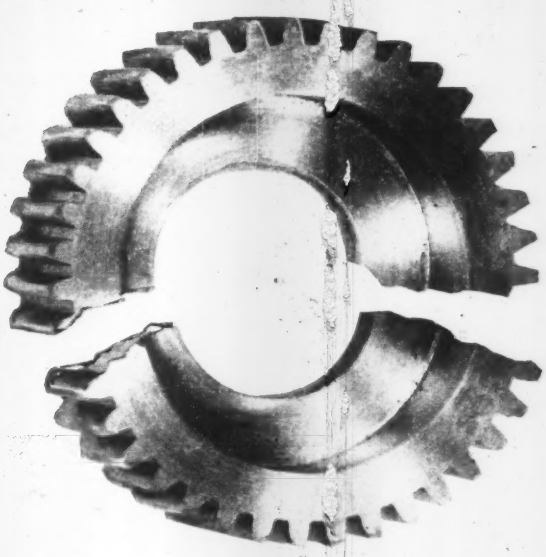
If you produce pipe or equipment for lines, take note: Major gas consuming areas may require by 1963 or 1964 at least four new 34-in. transmission lines of 1000 miles each. Ford, Bacon & Davis Inc., engineering and consulting firm, predicts the need for additional lines for the eastern seaboard, Great Lakes and California areas. Just last week, plans were revealed to construct a line from southern Alberta to California, to be jointly owned by Westcoast Transmission Co. Ltd. and Alberta & Southern Gas Co. Ltd.

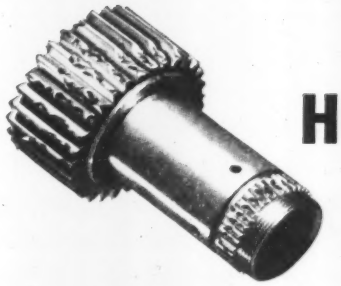
Watch These Weather Vanes

Private housing starts in September spurted to an annual rate of 1,220,000, highest since October, 1955. About 1,120,000 dwellings will be built this year, the same number next year. But capital equipment orders continue disappointing. The Foundry Equipment Manufacturers Association's August new order index was only 74.1 of the 1947-49 average, continuing a four-month drop. Sales of industrial material handling equipment fell off sharply in August, after midyear gains. L. West Shea, managing director of the Material Handling Institute, says that in spite of this drop, his industry has recovered faster than many others.

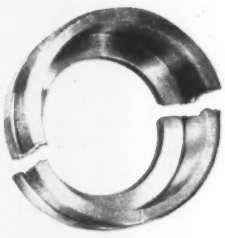
Straws in the Wind

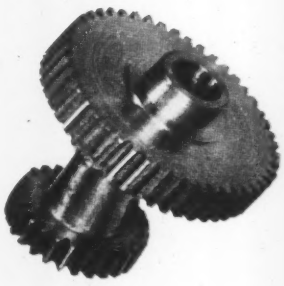
American Can Co. will produce 100,000 aluminum sardine cans a day for Franco-Italian Packing Co. . . . GM spent $500 million on dies, tools, and engineering for 1959 model changeovers . . . National Aeronautics & Space Administration will take over the Army's Redstone, Ala., arsenal and other facilities in a move to further centralize our space programs.





How to avoid alloy steel failures





Ordinary precautions may protect you most of the time. But your luck could run out—and a single alloy steel failure can result in serious loss.

That's why the *extra* precautions of the Ryerson Certified Alloy Steel Plan are important to you. Under this plan you know three vital facts about the alloy steel you order from Ryerson stock:

- **Heat identification** . . . not just type identification, but the positive identification of your particular heat of alloy which has been spark-tested and separately racked to eliminate the possibility of mixed steels.
- **Chemical analysis** . . . not just the chemical range for the type, but the specific analysis of the heat from which your steel was rolled—keyed to your steel's identification.
- **Hardenability** . . . not just the average hardenability for the type of alloy, but the actual test-proved hardenability of your particular heat of steel, as-quenched and at three draw temperatures.

As a result, you can be sure of the steel you get from Ryerson—sure of what it will do . . . and sure of how to heat-treat for desired properties.

This extra protection is yours at no extra cost. So call your nearby Ryerson plant for every alloy steel requirement—and be sure.

RYERSON CERTIFIED QUALITY

RYERSON STEEL®

Member of the INLAND Steel Family

Principal Products: Carbon, alloy and stainless steel—bars, structurals, plates, sheets, tubing—aluminum, industrial plastics, metalworking machinery, etc.

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • WALLINGFORD, CONN. • PHILADELPHIA • CHARLOTTE • CINCINNATI • CLEVELAND
DETROIT • PITTSBURGH • BUFFALO • INDIANAPOLIS • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

Using DSC-PORTSMOUTH

LPR

Long Production Run COILS

is like buying your wire at a lower price

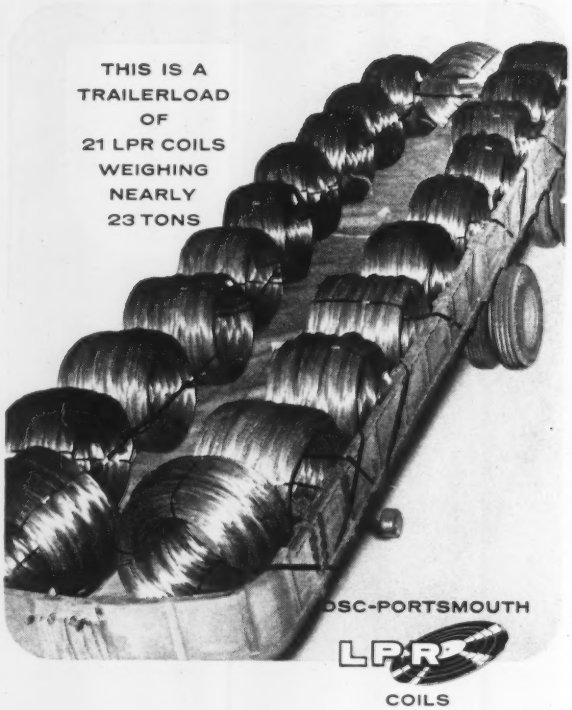
THE WIRE'S "CHEAPER" BY THE LPR COIL — Buying DSC-Portsmouth Bright Wire (low, medium or high carbon) in LPR coils is like paying less for the steel. That's because you pay nothing extra for the bigger unit packages, and in the bargain they help you reduce your storage, material handling and wireworking costs. For example:

LPR COILS RID YOU OF "RETURNABLES" — LPR coils are self-supporting: won't kink, tangle or topple; need no special carriers or similar contrivances for storage or in transit. They eliminate the "returnables" problem: you avoid the bother of extra bookkeeping; save the additional inbound and outbound freight charges on "loaners" and spare yourself the nuisance and the responsibility of material handling and storage of vendor property.

LPR COILS CUT HANDLING COSTS — They unload faster; conserve storage space; save time and effort in inventory control; lessen material traffic from stock to production line.

LPR COILS BOOST MAN-HOUR OUTPUT — Their use cuts the frequency of interruptions due to starts and stops and for machine adjustments; increases your production per set-up; helps you obtain greater productivity from existing equipment; minimizes scrap loss.

WHAT ABOUT LPR WORKABILITY IN HIGHER CARBONS? — All welded joints in DSC-Portsmouth single length coils in the higher carbon ranges are heat-treated to restore the required grain structure prior to drawing. That means consistency of workability regardless of coil length (or weight).



RESULTS — LPR coils increase your wireworking efficiency; give you smoother, steadier, increased output per man-or-machine hour, thereby reducing overall manufacturing costs and improving profits.

PRACTICAL POINTERS ON WIRE HANDLING — Whether you have a question involving LPR coils or wire generally, our specialized experience is at your disposal. Say when, and we'll go over your situation at your desk. Or, if you prefer, come to our Portsmouth Mill yourself as many of our customers do periodically. (They usually pick up a good idea or two.) Just let us know when to expect you. You'll be more than welcome.

For quick action on LPR coils or on other DSC Products and Services, please write our General Sales Office in Detroit or call your nearest DSC Customer "Rep" soon . . . *Today?*

BRIGHT WIRE LPR COILS

GAUGES

Low and Medium Carbon—.072"/.500", incl. .0475" to .062" made in 1000 lb. coils

High Carbon—.080"/.250", incl.

APPROXIMATE DIAMETERS AND WEIGHTS

Inside Dia. 18" to 22" Height up to 45"

Outside Dia. up to 45" Weights up to 4,000 lbs.

Customer Satisfaction Is Our Business

35TH ANNIVERSARY YEAR

DST

DETROIT STEEL CORPORATION

GENERAL SALES OFFICE, DETROIT 9, MICHIGAN

CUSTOMER "REP" OFFICES:

Charlotte, N. C., Chicago, Cincinnati, Cleveland, Columbus, Ohio., Dayton, Ohio., Detroit, Grand Rapids, Mich., Hamden (New Haven), Conn., Indianapolis, Jackson, Mich., Louisville, Ky., Milwaukee, Wis., New York, St. Louis, Toledo, Worcester, Mass., Winneconne, Wis.

The PROOF of DSC STEEL is in its PERFORMANCE on Your Job

DSC PRODUCTS: Coke . . . Coal Chemicals . . . Pig Iron . . . Basic Open Hearth Steel Ingots, Blooms, Slabs, Billets, Rods . . . HR and CR Sheet and Strip . . . Flat CR Spring Steel . . . Manufacturers' and H.C. Specialty Wire . . . Welded Wire Fabric

© DSC 1958

Your Stake in the Space Age

STEEL's latest edition of its Metal Selector (Page 165) will give you new insight into the fantastic space age in which we live.

Thanks to metalworking's research and production men, metals and alloys that were laboratory curiosities only a few years ago are now available in commercial quantities. They have also developed alloys that would have been beyond the stretch of our imagination only a few years ago.

Even though we're getting fairly used to such feats, it's still hard for most of us to assess the business potential in present and future space projects.

You can get a hint of the enormity of such undertakings from projects that are in the works. For example, 52 scientific and industrial organizations participated in the moon probe that reached an altitude of 78,000 miles. Two companies have contracts to develop the Dyna-Soar, the first manned space vehicle. A third hopes to put a manned vehicle in orbit around the moon within two years.

But such exotic applications only scratch the surface. To get a complete picture of metalworking's stake in the space age, you have to consider its many side benefits and obligations.

Benefits will be in the form of greater knowledge of materials and manufacturing knowhow.

We should feel obligated to use such information to improve the more prosaic things made of metals—like machine tools, food processing equipment, automobiles, and automatic washers.

One thing is certain: Your alert competitors won't hesitate to capitalize on such knowledge.

Irwin H. Such
EDITOR-IN-CHIEF

12 Ton Plymouth Locomotive operates 24 hours daily over 10 mile track system at this modern steel mill

PLYMOUTH lowers production costs by keeping steel in process on the move!

You get the reliability that returns greater profits when you put a Plymouth Locomotive to work—and the more continuous usage you give it, the more you benefit. There are many good reasons for that.

Plymouth Locomotives are built to handle big jobs with speed and efficiency around the clock—in all kinds of weather. Instant availability, low maintenance requirements, and faster switching, spotting and hauling performance reduces costs all around. Smooth starts and ease of control make Plymouth popular with the operators, reduce fatigue, and keep efficiency high.

We make both gasoline and Diesel Locomotives from 3 to 80 tons—either mechanical or Torqomotive (hydraulic torque-converter) drive—there's a Plymouth Locomotive that will fit your requirements perfectly.

"Saving time and money with our Torqomotive," says this user.

Within a few months after the Plymouth Diesel Torqomotive shown above was delivered, this Eastern steel manufacturer knew they had an outstanding locomotive. "Too early for actual cost figures," was the report, "but haulage by Plymouth is superior to previous methods. Our operator likes it better, too."

Send us a brief outline of your operation and we'll send you a recommendation promptly. Address: Plymouth Locomotive Works, The Fate-Root-Heath Company, Dept. A-1, Plymouth, Ohio.

PLYMOUTH® LOCOMOTIVES

WITH TORQOMOTIVE DRIVE

RAIL POWER

PLYMOUTH LOCOMOTIVES—
in PROGRESSIVE INDUSTRY
throughout the WORLD

ALSO BUILDERS OF
F-R-H CERAMIC MACHINERY

What 100,000 Cars Mean to Part Production

Components	Amount (millions of pounds)
Steel stampings	165.2
Aluminum stampings	2.0
Steel forgings	7.8
Gray iron castings	46.7
Malleable castings	5.2
Aluminum castings	4.6
Zinc diecastings	4.9
Electrical wire	2.0
Wire products	5.9

Based on average metal weight per car (3265 lb). Adapted from 1958 figures. Does not include scrap.

Suppliers Gage Detroit Optimism

They're beginning to believe the 5.5-million car estimates for '59. First reports from dealers sound high notes. Here's what it all could mean to component makers

DETROIT'S beginning to believe its forecast of 5.5 million sales for 1959. Two months ago, industry officials privately doubted that autodom could sell that many cars. Now they wonder if the 5.5-million prediction might turn out to be on the short side.

Some optimism is natural when new models appear. But the initial rush of orders has given motordom the hunch that it might be at the threshold of a boom year (see sales reports on next page).

• **Add 'Em Up**—If you're an automotive supplier, you'll want to know what a pickup in sales will mean to your business. Grab a slide rule and use STEEL's chart (above) to see how many more pounds of your product automakers will use every time they grind out another 100,000 cars.

Steel stampers, for example, can turn out 9,086 million lb of stampings if Detroit produces 5.5 million autos. At 5.6 million, the figure jumps to 9,251 million lb. (In a 5.5 million unit year, it should take the assembly plants about six working days to build 100,000 cars.)

• **Parcel 'Em Out**—It's still too early to know which lines will catch on, but autodom's observer corps suspects Buick and Chevrolet will be hot. Oldsmobile and Pontiac should improve their share of the market. So should Plymouth and Rambler. Studebaker's Lark will be a boom-or-bust car (see Page 139). Dealer reports show how some lines are moving now:

Qua Buick Inc., Cleveland: "Sales of '59 models are running at 200 per cent of the year-ago rate. We sold slightly more than 500 '58 Buicks. We expect to sell 1000 of the '59s."

Burke Buick Inc., New York: "This is the year and the car. We initially told the factory we could sell around 700 cars this year. Now we've raised the estimate to 1500."

Massey Buick, Pittsburgh: "Our '59 quota is 1800 retail deliveries. In 1958 (model year), we sold between 800 and 900. This looks like our best year since 1956."

Buick was the first car introduced this fall; its dealers sold 12,260 in the first ten days, compared with

U. S. Model Run Output

	1958	1957
Chevrolet	1,249,485	1,552,747
Pontiac	217,303	334,041
Oldsmobile	296,375	384,392
Buick	241,892	405,086
Cadillac	121,786	146,840
Total GM	2,126,841	2,823,106
Ford	987,945	1,674,343
Edsel	63,110	
Mercury	133,271	286,163
Lincoln*	29,684	41,710
Total Ford	1,214,010	2,002,216
Plymouth	399,556	651,008
Dodge	139,257	289,141
De Soto	51,552	122,040
Chrysler	60,873	115,420
Imperial	16,102	35,754
Total Chrysler	667,340	1,213,363
Studebaker	49,770	68,080
Packard	2,622	4,761
Total S-P	52,392	72,841
Total AMC	162,182	99,209
Total Industry	4,222,765	6,210,735

*Includes Continentals.

9869 in the similar year-ago period, reports Edward T. Ragsdale, Buick's general manager.

• **Venders Watchful** — Suppliers watch the market penetration of different models with keen interest. Asked what a 100,000-unit increase in car output would do to his sales and profits, one vender told STEEL: "That's about 2 or 2.5 per cent of the year's anticipated market, and it's just a drop in the bucket. Now ask me what it would mean if those 100,000 units all had Fisher bodies." He indicates that could mean a 15 per cent sales gain for his firm.

Suppliers are cautious but hopeful about 1959. The industry indicates it will gear inventories and production to sales—at least through the fourth quarter. Harold Churchill, Studebaker-Packard's president, says: "We won't be stockpiling materials this year. We'll buy steel as we need it. After all, there's no problem getting deliveries."

Steel releases for November delivery show some tonnage increases, but the traditional 30-day floats of flat-rolled products seem to be as high as automakers want to go. The same level applies to wire and bar products. Finished components, like frames and axles, are on slightly longer commitments.

Since supplier fortunes rise or fall with car sales, it's worth taking a look at the two big annual battles:

• **Ford vs. Chevy**—Judging from what J. O. Wright, Ford Div.'s general manager, has said about ostentatious design, it seems to be a question of whether buyers will want Chevy's radically redone chrome or the "tastefully restyled" chrome that Mr. Wright claims for Ford.

There's no real reason to believe the public will become any more sophisticated in 1959 than it was in '58 or '57, so autodom suspects the completely restyled Chevrolet will again have the sales edge over the Ford which practically retains its '58 silhouette.

• **Mediums vs. Lows**—All medium class cars (Edsel, Mercury, Pontiac, Buick, Oldsmobile, Dodge, De Soto, and some Chryslers) will be competing in a market that dwindled from 32 to 29 per cent this year. To make things tougher, Ford, Plymouth, and Chevrolet have added full series to the tops of their lines. And luxury cars will probably take their traditional 5 or 6 per cent share of the market.

For several years, Detroit has felt that some medium price cars will have to go. Studebaker is already out of that bracket. Rambler barely touches it with the Ambassador. Edsel, Mercury, and Pontiac have curtailed the number of models they offer. That may not be enough. Detroit figures the Edsel is a fading flower—and the situation is expected to worsen after Ford's La Galaxy series appears. The word from some Chrysler marketing sources is that De Soto may also be tagged for autodom's graveyard. The industry feels that medium priced cars will have to make a comeback in 1959 or a couple of them will become casualties.

• **Economy vs. Style** — Another campaign pits economy cars against SDPs (standard Detroit products).

George Romney, American Motors Corp's president, thinks that common sense favors economy cars. He claims they can take 50 per cent

of the market by 1965. Rambler sales rose 82 per cent during the 1957-58 fiscal year ended Sept. 30.

GM is an equally strong advocate of its case: It believes style and size still can command a premium price.

One thing is pretty certain: If standard Detroit products make a comeback in 1959, GM and Ford will put their small car plans in storage and leave the economy field to Rambler and Lark.

How Makers See '59 Car Sales

Oldsmobile—Orders for the new Olds are double those of a year ago, reports Jack Wolfram, division general manager.

Cadillac—James Roche, general manager, says: This is the best introduction of cars in my 31 years at Cadillac.

Chevrolet—Chevy's 7500 dealers have told the division they'll take all the cars they can get. The division figures it will be on overtime for 60 to 90 days before dealer pipelines are full.

Ford—Dealers have placed $1 billion worth of orders for Ford cars. This will require maximum overtime production in Ford plants well into November, says the division.

M-E-L Div.—Mercury, Edsel, and Lincoln dealers have placed $143 million worth of orders for 1959 cars. M-E-L does not indicate each line's share but says the investment represents $65,000 per dealer.

Imperial—"Because of strikes, we are not producing cars. Our dealers have placed only sample orders, but they are enthusiastic."

De Soto—New models are just out. Dealers tell STEEL it's too early to tell how sales will go. The division will not report on orders.

Plymouth—W. Hartsill Wilson, national sales consultant, Plymouth Div., says: "In view of the way orders are coming in and the way '58s are cleaning up, we're optimistic. It's better than last year."

Rambler—AMC reports firm dealer orders total 72,566, vs. 35,607 at the 1958 model introductory period. The company estimates it has sold close to 10,000 cars in its first ten-day period. That's 175 to 200 per cent better than the year-ago pace.

GM's Robert F. Thomson spells out threat to gray iron founders

Gray Iron Fights for Auto Markets and New Uses

GRAY IRON FOUNDERS are driving for new markets and better products. Their goal: To win new applications to replace those which may soon be lost to aluminum castings.

Dr. Robert F. Thomson, head of the Metallurgical Engineering Dept., Research Staff Div., General Motors Corp., gave members of the Gray Iron Founders Society a prescription for that industry to follow in countering the light metal's inroads.

• **Assignment for Gray Iron**—Dr. Thomson made six suggestions: 1. Win applications from wrought iron. 2. Find a method to take hot metal directly from blast furnaces to save remelting costs. 3. Produce better techniques of transferring metal from electric furnaces to molds to cut the slag content. 4. Develop high temperature materials. 5. Make thinner walled castings. 6. Find out how to die-cast iron.

If gray iron founders can't improve their products or find new applications for them, they will inevitably lose business to aluminum, warned Dr. Thomson and Darl F. Caris of the corporation's engineering staff.

The GM speakers told foundrymen at a meeting in Washington that aluminum engines compete in cost with those made of cast iron. "Car buyers want increased gasoline efficiency without reduction in car size. This will be accomplished by reducing engine and car weight through use of aluminum. Lighter tires and brakes will follow lighter engines," they added.

• **Aluminum Trend Grows**—"More and more, engineers will be trying to replace ferrous materials with

light metals," Dr. Thomson reported. He said aluminum engines will weigh 200 lb less than their cast iron counterparts.

Automotive use of the light metal jumped from 2 lb per car before World War II to an estimated 57 lb in 1959. Use of gray iron castings averages about 440 lb per car. A GM executive recently estimated that cast and malleable iron in a typical Chevrolet increased from 507 lb in 1942 to 538 lb this year.

Backing up their intention to increase use of aluminum, GM and Ford Motor Co. have ten-year molten metal contracts with Reynolds Metals Co., Richmond, Va., calling for use of up to 150 million lb of molten aluminum annually.

• **Foundrymen Fight Back**—Founders plan to react to aluminum's inroads as steelmakers did when faced with competition from other metals. "We must improve gray iron," stressed J. H. Culling, vice president-operations, Carondelet Foundry Co., St. Louis. He believes the electric furnace is the key to a new approach: "Heat resistant gray irons may regain some of the markets lost to ceramics." Other areas of interest include high integrity castings for defensework and foam iron as shielding material for atomic energy installations.

Walter Larson Jr., president, W. O. Larson Foundry Co., Grafton, Ohio, suggested that other industries don't have the weight problems that autos have, so they may not switch to aluminum. He added: "We have been resting too long on our laurels," pointing out that 150 foundries closed up in 1957.

Russians Reciprocate

Delegation sees "nothing new" in tour of U. S. steel plants but eyes equipment for taconite

NINETEEN SOVIET iron, steel, and mining experts have ended a tour of the U. S., reciprocating an American visit to Russian steelmaking centers. Their reactions include comments on these topics:

Russian Industry — Production is about 50 per cent for military, machine and industrial equipment, 25 per cent for construction, 15 per cent for piping and tubing, and 10 per cent for miscellaneous articles.

Russia's productivity is increasing 5 to 7 per cent a year through better organization, more modern equipment, and higher quality standards among workers. Steel production is expanding at the rate of 7 to 8 per cent a year and will total 165 million tons in 1973. (Production in 1958: About 60 million tons.) Blast furnaces run at 98 per cent of capacity; steel production and rolling facilities, at 90 per cent.

Steel Substitutes—Use of aluminum and reinforced concrete increases each year in the USSR. So does steel consumption. But they look to plastics as replacements for steel.

U. S. Industry — Although the Russians "saw nothing new" in steelmaking equipment here, they did show interest in our jet piercing (for taconite) equipment.

"We would buy it. Russia needs an extensive taconite development program. We might also purchase sintering equipment and pumps for water removal," they said.

The Soviets disavowed knowledge of plans for a large number of small plants in China. They said it was theoretically possible for the Chinese to produce steel from iron ore in 90 minutes as has been claimed.

To Finance Monorail

Murel Goodell, has resigned as president of Monorail Inc., Houston, to form a mass transportation finance company. "The company," says Mr. Goodell, "will supply Monorail Inc. with the financial support necessary to make sales."

Mr. Sixten Holmquist was named to succeed Mr. Goodell.

No commercial monorail lines (a mass transportation medium consisting of railway type coaches running suspended from an overhead track) exist in this country, but a pilot line is operating in Dallas.

Canada Cancels Contracts

A bleak outlook for the electronics and aircraft industries in Canada has resulted from defense contract cancellations by the dominion government.

The action followed a cabinet decision to replace Royal Canadian Air Force manned interceptors with U. S. Bomarc unmanned interceptors. A total of $503 million for Canadian missile, navigation and fire control equipment, and management group development programs was canceled.

The program to develop the CF-105 supersonic interceptor and Iroquois jet engine worth $1.3 billion, will be continued until Mar. 31 when it will also be dropped.

New Policy—Prime Minister Die-

THIS TRACTOR-TRAILER OUTFIT transports red hot ingots 1½ miles (from steel mill to rolling mill). A reheat is not needed. The brick lined box has hydraulically operated covers, and the trailer's gross carrying weight is about 95,000 lb. The equipment was designed by Dominion Foundries & Steel Ltd., Hamilton, Ont.

fenbaker said that Canada will not again attempt a major defense program of design, development, and production independent of the U. S. Officials of companies affected by cancellations termed Mr. Diefenbaker's objective "naive."

The possibility of U. S. and British parent companies giving work to Canadian electronics firms is not likely, as they are operating well below capacity.

Search for Scientists

Need for scientists, engineers, and technicians will be so great within ten years that they should be "recruited" from among young people entering high school, says the Scientific Apparatus Makers Association, Chicago.

In an SAMA survey of large U. S. corporations, 27 per cent of respondents predict double the present number of technical jobs will be available in 1968. Some 60 per cent forecast increases of 25 per cent or more in technical manpower requirements.

Respondents look for the greatest increases in professional needs to center in electrical and instrument industries.

Uranium Processors Aided

Fast tax amortization has been extended to facilities which process uranium ore and concentrate, says the Office of Civil and Defense Mobilization.

To be eligible, the facilities must be acquired under an AEC program.

U. S. Steel Ends Rail Items

U. S. Steel Corp. will discontinue making frogs, switches, crossings, and other railroad track items at its Johnstown (Pa.) Works. The plant will be used for expanded production of mill equipment and similar items for other corporation plants. Inland Steel quit making rails last September.

Markets for such products have declined: Shipments of rails (60 lb and over) dropped from 2,207,146 tons in 1947 to 1,194,405 in 1957.

Seven major U. S. manufacturers of this type of equipment remain in the field.

Bait for New Plants

Favorable business climate generated at polls is best lure, Republic's Patton asserts

"COMPETITION among cities to attract new business and industry grows sharper every year, and the strongest appeal is a favorable local business climate," says Thomas F. Patton, president of Republic Steel Corp., Cleveland.

When promoting an industrial area, emphasis is placed on location of markets, resources, and other physical factors, he told the Canton (Ohio) Chamber of Commerce. But unless the people in the area have the common sense to provide a favorable climate, such physical advantages are useless, Mr. Patton stated.

Source—He warned that business climate is generated at the ballot box. States which have elected the wrong men, passed the wrong laws, levied excessive taxes, and imposed hampering restrictions, have forced business to take plants and payrolls elsewhere. But Mr. Patton also declared that industry does not want special favors or to be excused from community responsibilities.

"Companies expect freedom to do business without crippling restrictions and ordinances and without being asked to carry an unfair share of the tax load. They also want proper law enforcement in times of labor strife," he said.

"We must accept the challenge of the various pressure groups and carry the fight for good, sound government to the polls."

Tyson Warns on Controls

Peacetime abandonment of competitive markets through comprehensive wage, price, allocation, and ration controls would mark the "point of no return," Robert C. Tyson, chairman of U. S. Steel Corp.'s finance committee, told the Texas Mid-Continent Oil & Gas Association. It would mean the abandonment of our system of voluntary and competitive choices of free men, he said.

Mr. Tyson warned that we are now in the most vicious inflationary spiral known to economic science. He declared that labor leaders are competitively forced to continually seek unearned wage increases and that progressive taxation is killing individual incentive.

STAINLESS STEEL DUCTS for the de-icing system of the first American designed and built jet-jet airliner (Lockheed's Electra), are made by Stainless Steel Products Inc., Burbank, Calif. The firm uses a precipitation hardening aircraft alloy, AM-350, supplied by Allegheny Ludlum Steel Corp., Pittsburgh

Carlon Products Corp.

Sales Rise Steadily

(Millions of dollars)

1959	60
1958	55
1957	50
1956	48
1953	35
1948	0.1

Source: Estimated by Society of the Plastics Industry Inc

It's lightweight. But that's only one reason why . . .

Plastic Pipe Gets Big Play

THE YOUTHFUL plastic pipe industry is headed for a record sales year—despite the recession, a rash of price cutting, and other problems. It has fast become a major threat to producers of metal pipe for applications where high temperatures and high pressures are not involved.

• **How It's Growing**—Sales to consumers this year will reach $55 million, estimates the Society of the Plastics Industry, New York. That's 10 per cent over last year's record (see table). More than 85 per cent of the volume is claimed by 12 producers.

In 1948, six firms made polyethylene pipe. Today, around 50 companies make many varieties on a proprietary basis. Perhaps another 50 extruders are custom producers.

Major types of thermoplastic pipe are polyethylene (high, medium, and low densities), ABS (acrylonitrile - butadiene - styrene), PVC (polyvinyl chloride), and CAB (cellulose acetate butyrate). A few firms also produce epoxy resin pipe reinforced with glass fiber; about $750,000 worth of that will be sold this year, believes SPI.

A few steel companies, like U. S. Steel Corp.'s National Tube Div. and Republic Steel Corp., have entered the thermoplastic pipe field. Some others, like Youngstown Sheet & Tube Co., are making thermosetting plastic pipe.

• **Why It's Growing**—Producers list these reasons for the mounting popularity of plastic pipe and fittings: 1. Excellent corrosion resistance. 2. Light weight. 3. Ease of installation. (Tube Turns Plastics Inc., Louisville, claims a journeyman plumber using PVC in place of cast iron can make twice as many joints a day.) 4. Nontoxic. 5. Price is usually lower than the metal pipe it replaces. 6. Long life. 7. Nonconductor of heat and electricity. 8. Smooth interior walls in PVC prohibit paraffin buildup — an important consideration in the oil and gas industry. 9. Little breakage.

• **Where It's Growing**—Major applications include cold water distribution (in rural and suburban areas), gathering lines in oil fields, jet wells, the handling of corrosive materials (like in pickling and plating operations), and movement of many other fluids and gases. It is making giant inroads on metal pipe in places where corrosion is an important factor. Examples: Sewerage and industrial waste disposal, mine drainage, salt water lines, and the transmission of chemicals.

Conducting water and gas from mains to houses is a market with vast potential, producers say. But, so far, the American Waterworks Association and American Gas Association have approved plastics only for test installations. Extruders, kept from moving into that market by city codes, are working for the adoption of new ones.

Carlon Products Corp., Cleveland, names these uses for PVC pipe: Acid reactor blowoff lines, industrial drain and sewer lines, and process lines handling acids, alkalies, oxidizing agents, alcohols, brines, plating solutions, slurries, and acid fumes.

Goodall Rubber Co., Trenton, N. J., has found a market in radiant heating. B. F. Goodrich Industrial Products Co. says one of its major markets is uranium ore plants. Western Plastics Corp., Tacoma, Wash., says there is a good market in lawn sprinkler systems. Valco Corp., St. Paul, sells plastic pipe for antenna masts. Busada Mfg. Corp., Maspeth, N. Y., says a big application is in underground conduit for power lines. Whitehead Metal Products Co., New York, reports the Navy is using plastic pipe for radiation washdown systems aboard ships.

W. E. Jacobson, executive vice president, Yardley Plastics Co., Columbus, Ohio, believes plastics will be developed to conduct hot water in the near future.

• **What Halts Growth**—Most producers agree with C. R. Owen, sales manager, Colonial Plastics Mfg. Co., a division of Van Dorn Iron Works, Cleveland, that the industry must step up its education efforts. Many users (and potential users) don't realize the great variation between the different types of plastic pipe. Picking the right kind of plastic for a particular application is almost as complex a job as picking the right type of steel.

Another problem: As in any young industry, there are some firms producing inferior products and throwing them onto the market at bargain prices. And some overstate the physical properties of their product, say industry leaders. The more reputable firms agree that this practice must be halted soon or it will hurt the whole industry. Some steps have been made: The Department of Commerce has published a commercial standard that is met by most producers. Most have also earned the right to display the seal of the National Sanitation Foundation. SPI members are working with the American Society for Testing Materials.

Price competition has been rugged in the industry; it's especially so in the West. Add to those difficulties the job of getting city codes changed and you see the industry's dilemma. It is also feeling some competition from Japanese imports.

• **The Future**—New materials, new joining methods, and other developments promise steady, rapid sales growth. Kraloy Plastic Pipe Co., Los Angeles, expects to boost its sales volume 1000 per cent in the next five years. SPI predicts an industry record of $60 million in '59.

New materials include high density (rating over 0.940) polyethylene, new ABS materials, and polypropylene. Solvent type joints and a steady stream of new fittings also promise to enlarge markets.

Joseph T. Ryerson & Son Inc., Chicago, expects the dairy industry to become a good market by 1963.

• **Sidelights**—Item 1—The hula hoop craze has been a blessing to the industry. It has taken about 5 million lb of scrap polyethylene off the market, estimates one producer.

Item 2—A major maker is experimenting with coal chemicals as a possible source of pipe material.

Ladies Air Appliance Woes

APPLIANCE manufacturers and suppliers, hear this: 100 U. S. housewives told about their appliance experiences (good and bad) at *McCall's Magazine* Congress on Better Living. Representing the 49 states, median family income was $8500 per year; median age, 32 (when they admitted it). Fifty-four said their husbands were technical or professional personnel, sixteen were managers, nine were salesmen. Average value of their homes was $15,000; 95 owned them.

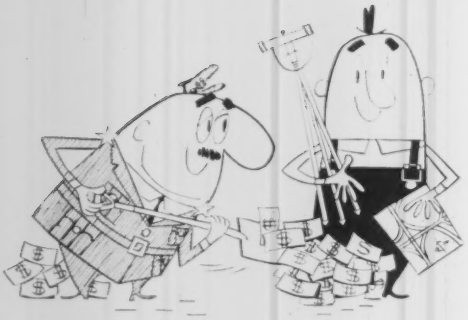
• **To Buy or Not to Buy**—Seventy-one think now is a good time to buy a major appliance, but they prefer to buy one item at a time when it is put on a long term installment plan. They reason that the use of the article is worth the interest they must pay. They will probably return to the same brand of appliance that they already have when they start looking for the new dishwasher or range.

• **Obsolescence**—They have strong feelings about washers. The new ones "shake themselves to pieces," comments one lady. She remembers her old XYZ brand which lasted for ten years before she finally replaced it as a matter of style or design, rather than utility.

A dishwasher is their heart's desire, but it will be the last major appliance purchase for most. Portables aren't in high favor. Washer-dryers didn't get much approval; some reported retailers had advised them that better combinations would be available in a few years; they should buy separates now.

• **Complaints**—Keeping all their equipment shiny concerns them. Stainless steel was preferred to chrome. "And why don't we get more double ovens?" several asked. Many of the ladies talk of one major brand as "absolutely the last product" they would buy, whether it was a small or large appliance. They generally gave the large retail chains (with their own brand names) a vote of thanks for inexpensive products and excellent service.

• **Service Problems**—"I keep buying my automatic washer back from the serviceman," lamented one. "The appliance is only as good as the service," added another. They wanted more information from the manufacturer so their husbands could make minor repairs. One woman reported she wouldn't buy one of the new extra cycle washers because she was afraid of the service needed to maintain it. Generally, the utility companies received the most praise for service. The ladies were also convinced that installment buying guaranteed better service.



Should Defense Share Highway Load?

THE FEDERAL highway program isn't out of the fiscal mud yet. It may take a tug from the Defense Department to extricate it.

The Bureau of Public Roads says the program is finally approaching the dimensions charted by planners in 1956, but it now faces a shortage of funds to keep it on its course. Several possibilities are open. The American Automobile Association prefers this route: A percentage of the responsibility for highway finances should be assigned to nonhighway users who indirectly benefit from the program. Dollars would be legislated into the fund, for example, from the Defense Department because of the acknowledged dependence of the armed forces on highways in an emergency. (The Pentagon has just about written off the railroads if the U. S. comes under attack.)

Alternative routes outside of fallout areas will prove this country's lifeline for the quick transport of mobile missiles, as well as the evacuation of civilians from contaminated areas.

Outlook: Congress will not follow the AAA program next session. But discussion of it, in light of the controversy among the services over permanent or mobile missile bases and the recommendations of some high government sources for a multibillion dollar shelter program, will stir the thinking of some Capitol Hill highway leaders. Eventually (and presumably before the interstate system founders in the financial mire), look for defense dollars to be used on highways. Most congressmen recognize that the road program will never really end if the country's need for highways continues to expand. They're already partially sold on highways as a practical substitute for permanent missile bases and civilian shelters, so they may come around rather fast to the AAA point of view.

Congressional Alternatives

Three other routes are open to Congress next session, says AAA's Kermit Rykken: 1. Leave the tax structure alone and allow the program to extend to 25 years (instead of 15 more) to fit the funds available. 2. Increase gasoline taxes 1.5 cents per gallon and keep the program on schedule. 3. Repeal the Byrd amendment (which calls for the interstate to be financed solely from the trust fund on a pay-as-you-go basis) and authorize general treasury funds to hold the schedule through 1962; then re-evaluate the whole program in the Congress of 1961, after the new estimates are in.

Mr. Rykken guesses Congress will not extend the program to 25 years, and that the states will fight increased gasoline taxes. Congress will most likely repeal the Byrd amendment as a stopgap to get it off the political hook, then let a later Congress face up to the situation.

Reason for all the money seeking: Tax revenues slated to go into the highway trust fund through 1972 are estimated at $24 billion: Costs are figured at $36 billion. Refinements in design (more interchanges, lanes, and bridges) and a 15 per cent boost in estimated costs partly account for the deficit. A new estimate to be made in 1961 will show further cost hikes plus some additional mileage recommendations. The deficit could approach $15 billion.

Rains Sees Housing Decline

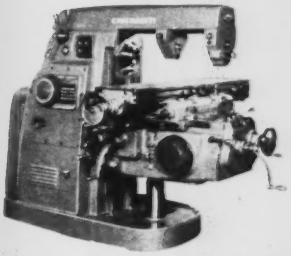
"A serious decline in housing starts" will come next spring unless more federal dollars go into the housing program, predicts Rep. Albert Rains (D., Ala.), chairman, Housing Subcommittee, Banking & Currency Committee. He wants the administration to release $400 million in mortgage support funds (voted by Congress in April but withheld by the Budget Bureau) and thinks Congress should provide another $1 billion in January to support low cost Federal Housing Administration loans and GI loans.

Tight money and higher interest rates are working against the housing program: "The Federal Reserve Board is taking a desperate gamble," says Representative Rains, by applying the credit brakes so soon after the start of the recovery (in large part led by housing starts).

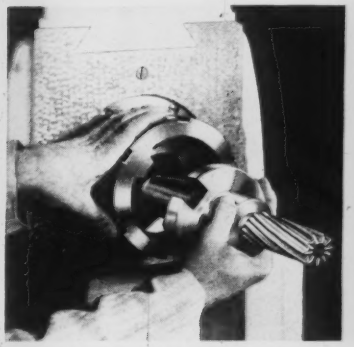
Capitol Notes

A U. S. Customs Court decision may put the lead and zinc quota system in jeopardy. Justice Department lawyers are checking into the President's right to accept Tariff Commission decisions in part, as he did in the lead and zinc case. The court held he cannot alter commission decisions. . . Office of Civil & Defense Mobilization is checking claims that imports of cobalt and tungsten are harming domestic industries. . . OCDM will divert to industry all nickel scheduled for the stockpile in 1958. . . Boeing Airplane Co. received the assembly and test contract for the Minuteman.

Dial Type convenience and ease of control is a big factor in producing multiple operation work at low cost.



CINCINNATI Plain Dial Type Milling Machine. Also Universal and Vertical styles. Built in Nos. 2, 3 and 4 sizes, 10, 15 and 20 hp. Catalog No. M-2003.



ARBOR-LOC is a big timesaver in interchanging the seven cutting tools on the table of the CINCINNATI Dial Type Milling Machine shown at the left.

EASY DOES IT

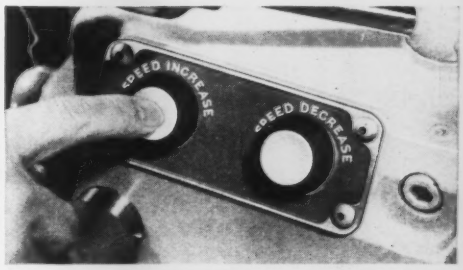
. . . for Dial Type Operators

Ask the man who runs one. He'll tell you that CINCINNATI Dial Types are easy and convenient to operate and set up, and they help him maintain high quality . . . important considerations in low cost of production. Three operator-approved features of convenience are illustrated here.

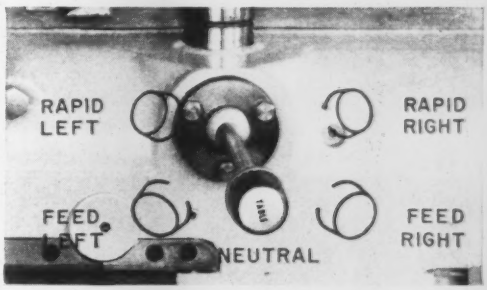
Others include:

Automatic backlash eliminator for milling to the right or left . . . Power selection of 32 feeds . . . Independent directional control levers, with palm-fitting plastic knobs . . . Identification discs on all control lever knobs . . . Dynapoise chatter-damping overarm, automatically damps out chatter and improves finish on the work . . . Complete rear controls (plain and universal styles)

More information in our new comprehensive catalog No. M-2003. And if you must justify replacement, ask for a copy of our manual No. M-1838.



Push-button selection of 24 spindle speeds, throughout 16 to 1600 rpm range (18 to 1800 rpm for No. 2 Dial Types).



Five-position lever gives the operator complete one-hand control of the table (automatic cycle machines).

Milling Machine Division
THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

CINCINNATI®

Knee Type Milling Machines • Bed Type Milling Machines • Die Sinking Machines
Cutter and Tool Grinders

Pot room in modern aluminum smelter at Isle Maligne, Quebec.

To aluminum fabricators...

who want the advantages of primary production –without the overhead

Aluminum production is a complex business. To operate a smelter made up of dozens of "pot-lines" like the one above presents innumerable problems: raw material supply, vast quantities of electric power, trained personnel, careful quality supervision—the list is nearly endless. Yet this pot-line and dozens like it in Quebec and British Columbia are at your service through Aluminium Limited.

If you would like to learn how these modern aluminum plants can work for you, call your Aluminium Limited representative. His company sells no consumer products in the U.S. Instead, it specializes in bringing you the primary aluminum you need . . . produced in a wide variety of ingot forms and alloys . . . quality-controlled to assure you every manufacturing economy. In short, all the advantages of your "own" primary production—without the overhead. For information call or write the nearest office of Aluminium Limited Sales, Inc.

Aluminium Limited

Ingot Specialist...serving
American Aluminum Fabricators

In the U. S.—Aluminium Limited Sales, Inc.
630 Fifth Avenue, New York 20, N. Y.

CLEVELAND • CHICAGO • LOS ANGELES • DETROIT • ATLANTA

Additional distribution (Alcan Foundry Alloys):
Apex Smelting Company, Chicago, Cleveland, Los Angeles
Charles Batchelder & Company, Botsford, Conn.

How You Can Test a Part for Value*

1. Does its use contribute value?
2. Is its cost proportionate to its usefulness?
3. Does it need all its features?
4. Is there anything better for the intended use?
5. Can a usable part be made by a lower cost method?
6. Can a standard product be found which will be usable?
7. Is it made on proper tooling—considering quantities used?
8. Do material, reasonable labor, overhead, and profit total its cost?
9. Will another dependable supplier provide it for less?
10. Is anyone buying it for less?

*Source: General Electric Co.

Suppliers Can Help You Trim Costs via Value Analysis

VALUE ANALYSIS can be doubly effective if you can get your suppliers into the act with you.

Such a philosophy works for International Harvester Co.'s Tractor Works in Chicago, which has tested it out in two "Suppliers' Relations Day" programs.

On Oct. 3, 90 top executives from 45 firms making perishable tools were day-long guests of IH Tractor executives.

Highlights of the program, conducted informally, were:

- A tour of the Tractor Works facilities plus an outdoor equipment demonstration.
- An outline of the company's standardization and value analysis programs.

"Harvester began its value analysis activities less than a year ago," says Jack Kenny, who heads up the program. "We started out by giving all management personnel and selected technical personnel a two-day classroom indoctrination of principles."

Helps Trim Costs—Cost reduction programs have saved nearly $2 million at the Tractor Works in the last year. Value analysis is credited for a large part of the total.

Emphasis has been on part design and materials. When value analysis disclosed real and potential savings involved purchased parts, the company felt an urgent need to thoroughly explain the program and company objectives to suppliers.

Mr. Kenny cites two of many examples found:

"We were purchasing three wire cables (they varied only inches in length) for different models of equipment. The price differential between the three—even though purchased from the same firm—seemed excessive. We standardized on one length for all three applications and renegotiated the price with the producer.

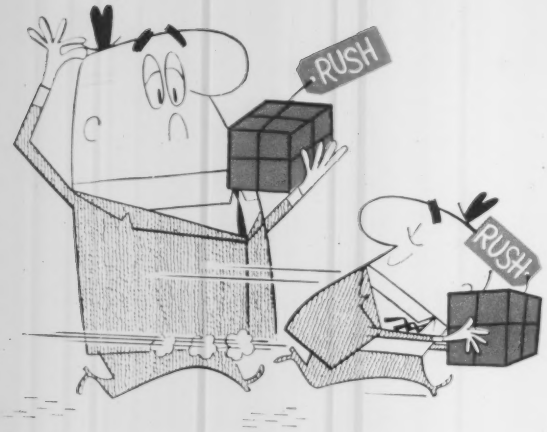
"In another instance, involving an electrical component, we were purchasing two units, identical except for lead wire length—again only inches different. We were actually paying more for the short lead wire part. The supplier was unable to explain the price differential. We standardized on a single unit and secured a lower price from the supplier."

Suppliers Benefit, Too—In both cases, he said, the suppliers were happy with the result because standardization provided one long production run on each part instead of three short ones on the cables and two on the electrical component.

Harvester officials admit that occasionally the situation may be reversed: The supplier finds that he's been charging too little for an item and renegotiates a higher price.

One objective in explaining value analysis and its approach to suppliers is to get them, too, to contribute suggestions for "equal or better quality at lower price." A suggested seat design change not only cut the unit cost to IH but rid the manufacturer of a major headache.

"Response to the program has been tremendous," relates Mr. Kenny. "We had 100 per cent acceptance of invitations to participate in our last program. At the request of a couple of firms, we've even helped them set up value analysis programs in their own plants."



Small Firm Can Act Faster

It can maintain closer customer contacts, fill needs more quickly than big competitors. Little tool builder proves size is asset: Boosts sales $3 million in six years

IF YOUR firm is small, you can take advantage of its size. You're in a better position than large companies to keep in tune with your customers' needs, and you can move more swiftly than your big-company competitor to meet those needs.

That knowledge has spelled success for Boyar-Schultz Corp., Chicago, a 175-employee small tool builder. Its sales have climbed from $1 million in 1952 to over $4 million annually.

The Means—"New products have paced our growth," relates Frank Korte, president. "We've averaged four or five a year—the majority stemming from efforts to solve a particular customer problem."

"And that explains our major emphasis on medium and small size firms," adds Willard Sullivan, vice president. "It's easier to cultivate both employees who are using the equipment and the individuals who control the purse strings for its purchase. In the larger firms, cutting red tape as you progress through the channels (admittedly necessary in most cases) takes time."

The biggest impetus to Boyar-Schultz's growth was the development of its 6 x 12-in. surface grinder in 1949. Over 10,000 units have been produced.

"Here was a need in every customer's toolroom," says Mr. Sullivan. "Big expensive grinders were available, but there were no small, economical units. We made a survey and the potential loomed big—over 80 per cent of the toolroom grinding applications could be handled on a unit costing less than $1000."

The Method—At Boyar-Schultz, conducting a survey is a do-it-yourself project with the entire management and sales teams participating.

"Often when we develop a new tool, we ask the salesmen to demonstrate it to all prospects. We want the customers' reactions and suggestions, and we want to know how they feel about the price," relates Mr. Korte.

Here, again, the emphasis on medium and small size firms pays off. Generally, the workers who'll use the tools and the executive who O.K.s the purchase witness the demonstration.

"Within a short time we can get reports from as many as 300 firms and have a sound basis for making a decision whether to put the tool into production," says Mr. Korte.

Executive Contact — Both Mr. Korte and Mr. Sullivan frequently call on customers to maintain close relationships with their business activities and problems. Shop problems aren't the only kind solved.

"We started a leasing program several years ago," the officials explain, "to help some of the smaller fellows get a start or expand their operations. It has been a successful, growing program for us."

Commercial job shop activity has been another factor in keeping close contact with customers and their problems. Tooling contracts are maintained with large firms like Continental Can Co., Western Electric Co., and AC Spark Plug Div. of General Motors Corp. About 35 per cent of Boyar-Schultz's volume this year will be in jobbing contracts.

"This activity provides us a type of laboratory," Mr. Sullivan emphasizes. "We keep pace with new developments and tooling requirements. We are confronted with the same problems our customers face and it's here that many new product ideas originate.

"One example: Clamping work on milling machines by conventional hand methods always seemed expensive timewise. So we developed a hydraulic clamping device that'll cut work changing time by 12 minutes. It's being patented and will be on the market shortly."

Good Communications — Boyar-Schultz is also paying more attention to its 72 independent distributors scattered across the country. It conducts educational programs for distributor salesmen. It encourages distributors to have private shows by picking up part of the tab.

The establishment of branch offices in New York, Detroit, and Los Angeles has also contributed to Boyar-Schultz's growth since '52.

Keeping in tune with customer needs is effective only if you can move quickly, believes Mr. Korte. "Solving a customer problem is only half the battle. If you're small and have a competent management team, you can check your market potential and get into production quickly if it looks good. That's your advantage."

NEA

Sen. Carl Mundt (R., S. Dak.) asserts that . . .

U. S. Needs Labor Laws Now

"IT USED to be axiomatic to say that economic conditions determined political decisions. Now it's more nearly true to say that political decisions determine economic conditions." With those words, Sen. Carl Mundt (R., S. Dak.) outlined the responsibility businessmen have in the fight to curb labor union abuses and power.

Speaking to an Associated Industries of Cleveland conference, the senator blasted the tendency for power to slip out of the hands of union members into the hands of union bosses and racketeers.

Federal legislation is needed to correct the situation. No present laws can deal with it, and unions lack the democratic procedures to do it themselves, Senator Mundt concluded.

Senator Mundt is a member of the Senate Select Committee of Improper Activities in the Labor or Management Field (the McClelland Committee).

Competitive Negotiating—Stanley H. Brams, publisher of *Labor Trends*, noted that lower profit margins brought about by rough competition have stiffened management's resistance to contemplated union demands.

He noted these trends emerging in bargaining:

1. More aggressiveness on the part of management.

2. Companies going to greater lengths to sell their side of the dispute to the people. The climate is now good for public support.

3. Management communications are beginning to reach employees. Workers are beginning to wonder about the relationship between wage increases and price increases.

4. Companies are starting to look upon labor relations as a year-round activity, not something to be worked over only when a problem arises.

Business Climate — Jules Backman, professor of economics at New York University, noted that fear of inflation "goes far beyond what is warranted."

To back up this statement, he cited:

1. Wholesale prices have not gone up.

2. There has been no undue increase in the money supply, and none is expected.

Mr. Backman added that he thinks we "do not face a pyramiding federal deficit." He noted that we can expect no dip as recovery strengthens since both corporate and personal income will rise. Fewer people will be receiving unemployment income. Record farm crops will act as a barrier to rising food prices.

The economist listed things to look for in next year's economy. As expanding forces he noted: Government spending will continue its rise and will be about $6 billion higher next year than it was in '58. Consumer disposable income will continue to rise. The number of building contracts will increase.

Neutral forces in the '59 economy are: Residential housing should continue at about its present pace; plant and equipment spending will stay at its present level—overexpansion will necessitate that.

On the negative side, Mr. Backman pointed out that rising interest rates will curtail stock market speculation and spending.

Apprentice Plans Pushed

To combat the critical shortage of skilled tool and die workers, 25 two-man teams swung into action in the Chicago area. They called on large and small metalworking companies, urging them to install apprentice programs or expand and improve what they have.

More To Come — The Chicago Area Apprentice Drive is the result of joint planning by government and industry. The Federal Bureau of Apprenticeship & Training, through the efforts of Secretary of Labor James P. Mitchell, sought the co-operation of the National Tool & Die Manufacturers Association in emphasizing the need for an adequate, skilled work force.

Because of its diversification in the metalworking industry, Chicago was selected for a test preparatory to launching a national drive.

STAINLESS STEEL TUBING

to meet all commercial and military specifications.....

TYPICAL APPLICATIONS OF WALL TUBING

Aircraft Conduit Lines
Aircraft Fuel Lines
Aircraft Hydraulic Lines
Aircraft Structural Parts
Appliance Parts
Beverage Dispensers
Bottle Filling Equipment
Cook Ware Parts
Chemical Processing Equipment
Dairy Equipment
Dyeing Machinery
Heat Exchangers & Condensers
Electronic Parts
Evaporator Units
Fittings
Fuel Injection Systems
Food Processing Equipment
Gas Appliances
Gas Safety Appliances
Gas Torch Equipment
Heating Elements
Heat Transfer Equipment
Injection Tubing
Instrumentation Lines
Milk Lines
Musical Instruments
Oil Burner Parts
Petroleum Refining Equipment
Pulp and Paper Machinery
Radio Air Antennas
Restaurant Equipment
Screw Machine Parts
Soap Dispensers
Soda Fountain Lines
Solenoid Valves
Surgical Instruments
Television and Radio Parts
Unit Heaters

MANY YEARS of performance are behind Wall Tube's tradition of top quality and dependable delivery. From a standpoint of product excellence, of economy or reliability . . . Wall Tube can be a significant addition to your sources of supply. Write today for our new catalog. "STAINLESS STEEL TUBING FOR INDUSTRY."

STAINLESS STEEL TUBING RANGE OF MANUFACTURE

Welded and Cold Drawn: 1¼" OD to 3/32" OD .083" to .008" walls.
Seamless: ⅝" OD to 3/32" OD .049" to .008" walls.

WALL TUBE AND METAL PRODUCTS CO.

STEEL SERVICE CENTERS

AMERICAN STEEL WAREHOUSE ASS'N

ARE DOING A JOB FOR YOU!

WALL TUBE AND METAL PRODUCTS CO.
NEWPORT, TENNESSEE

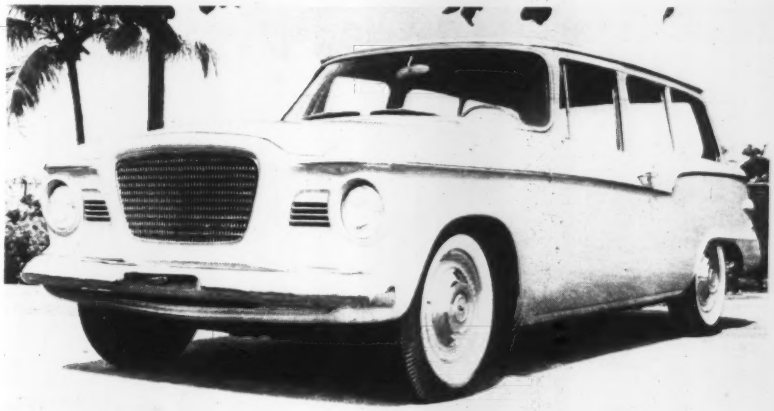
Please send your catalog "Stainless Steel Tubing For Industry" to:

Name_____

Firm_____ Title_____

Address_____

• NEWPORT TENNESSEE •



The 1959 Studebaker Lark station wagon features low center of gravity

S-P Hopes Lark Will Sing

The South Bend carbuilder is down to two basic models as it makes a last ditch stand for survival. It's betting nearly $17 million worth of tooling on the Lark's success

HAROLD CHURCHILL, president, Studebaker-Packard Corp., believes there aren't enough small cars available to fill the motoring public's needs. "They're being forced to buy much smaller imports as a substitute," he says.

Semantically, Mr. Churchill disagrees slightly with his fellow enthusiast, George Romney (American Motors Corp. president). The S-P chief emphatically points out that the Lark is an economical—not an economy—car. Pointing to Studebaker's Scotsman which sold just over 30,000 units during the 1958 model year, Mr. Churchill declares: "The Scotsman was an economy car; that is, it was an austere model. The Lark will have some trimmings. It will be reasonably stylish, but it will be an economical car to buy and operate." He says the car will list under $2000. Trade sources claim prices will range between $1795 and $2400. The Lark cost less than $17 million to tool.

• **Last Chance** — If the Lark doesn't sell, motordom thinks this will be S-P's last year in the automobile business. Of its once distinguished lines, only the Silver Hawk is left. It and the Lark must account for 127,000 unit sales if the company wants to show a profit in 1958, says one S-P executive. AMC's breakeven point is around 113,000 units.

While Mr. Churchill won't make any official sales predictions, he reportedly is thinking in terms of 155,000 to 160,000 cars. Initial orders for the Lark, which will appear in 2300 dealer showrooms on Nov. 13, give just cause for optimism: They amount to slightly over half the total '58 model year output of 49,000 cars, or double the initial order figure for the Scotsman at this time last year. Studebaker-Packard's South Bend, Ind., plant can turn out 70 to 72 cars an hour. It can produce 280,000 units annually.

• **Competition** — Packagewise, the Lark's body is Rambler American size. Its wheelbase is in the Rambler Rebel category. The compact body with a long wheelbase makes for easier riding. Mr. Churchill declares the Lark will compete with the Rambler Rebel—because leg and shoulderroom, plus the longer wheelbase, are more comparable with those features in the larger car.

With the Lark and Silver Hawk, S-P offers eight model series instead of the 18 it had this year. Color options have been reduced from 13 to 7. One fabric pattern will be used in all cars. De luxe Larks are available in two and four door sedans and a two-door station wagon. Regal models come in four-door, sedan, two-door hardtop, and two-door station wagon styles.

Front fenders are bolted to a reinforced box section frame. Front and rear end sheet metal parts are stamped out as single pieces to reduce maintenance costs. The grille is chrome plated, stamped steel. A retainer ring (a zinc diecasting) surrounds the grille on Regal models.

The Borg-Warner automatic transmission is optional on all cars. So is Studebaker's 259 cu in., V-8 engine—rated at 180 hp (195 hp with a four-barrel carburetor). Compression ratio is 8.8:1. The 6-cylinder powerplant has 170 cu in. displacement, develops 90 hp, and has an 8.31:1 compression ratio.

The Rambler American's engine also is rated at 90 hp. The Rambler Six has 127 hp and the Rebel V-8 turns out 215 hp.

Ford Has High Alloy Steel

Researchers at Ford Motor Co.'s scientific laboratory, Dearborn, Mich., have developed processing methods which give modified 4340 steels yield strengths exceeding 400,-

(Material in this department is protected by copyright, and its use in any form without permission is prohibited.)

How Little Two Compare

	Rambler American	Rambler Rebel	Studebaker Lark
SEDANS			
Wheelbase	100 in.	108 in.	108.5 in.
Length	178.3	191.1	175
Front seat legroom	44	43	44
Rear seat legroom	37.5	40	40.5
Rear seat shoulderroom	49.7	57.6	56
STATION WAGONS			
Wheelbase	100	108	113
Length	178.3	193	184.5

000 psi. The Ford alloys have higher ductility than present 4340 composition steels. Fatigue limits are around 200,000 psi and the alloy will retain its properties at − 385° F.

E. D. Marande, manager of the laboratory's metallurgical department, believes the fine grain alloy will be a natural for missilework. Reason: It compares with high strength titanium alloys now in use. "On a strength-to-weight basis, steel would require tensile strengths of 340,000 to 430,000 psi to equal the titanium alloys. The Ford steels match that," says Mr. Marande.

The Ford process is a refinement of the work of Dutch investigators, Lips and Van Zuilen, who have formed similar alloys in wire and thin strip forms. Ford uses conventional fabricating equipment and can make the steel in any required size.

The process consists of plastically deforming metastable austenitic steels above the martensite temperature, then transforming them to martensite by quenching and tempering at 500° F. Working temperatures range between 700 and 1000° F.

GMC Foresees Strong Sales

Truck sales should reach 1.1 million units in 1959, predicts R. C. Woodhouse, general truck sales manager of the GMC Truck & Coach Div., Pontiac, Mich. Some 900,000 units will be for domestic use, another 200,000 for export, he adds.

Mr. Woodhouse says 1959 sales will exceed 1958's by 21 per cent. He estimates there will be between 730,000 and 740,000 domestic retail truck deliveries in '58 with an additional 160,000 units for Canada and other export points.

U. S. Auto Output

Passenger Only

	1958	1957
January	489,357	642,090
February	392,112	571,098
March	357,049	578,826
April	316,503	549,239
May	349,474	531,365
June	337,355	500,271
July	321,053	495,628
August	180,324	524,354
September	131,952	283,852
9 Mo. Total	2,875,179	4,676,723
October		327,362
November		578,601
December		534,714
Total		6,117,400

Week Ended	1958	1957
Sept. 13	24,072	85,816
Sept. 20	37,150	52,365
Sept. 27	42,599	51,552
Oct. 4	34,464	21,975
Oct. 11	34,443†	38,526
Oct. 18	35,000*	72,180

Source: *Ward's Automotive Reports.* †Preliminary. *Estimated by STEEL.

GM Small Car? Maybe

General Motors Corp. is still weighing the possibilities of building a small car in this country, says the company's new president, John F. Gordon. The decision may hinge on the showing the '59 models and foreign cars make in the next few months.

"We don't know which way the cat is going to jump, or when," Mr. Gordon comments. "Our objective is to give the consumer the type transportation he wants."

GM is no stranger to small cars. The corporation has been building them abroad for 30 years and is now distributing 3600 of them per month here.

Sales—GM's chairman and chief executive officer, Frederic G. Donner, goes along with the predictions that industry sales will hit 5.5 million passenger cars in 1959. Although he wouldn't predict his own company's sales, he says GM is out to increase its present 49 per cent share of the market.

Shutdowns—GM's biggest problem now is to get its plants back to work—90 out of 116 are still struck. Reason: Local contracts have to be negotiated on a plant-by-plant basis because of local issues.

Mr. Gordon points out that although a national contract has been signed it has not been ratified. Deadline: Oct. 20.

He terms the new labor contract a "reasonable and fair settlement." GM's original offer was for a two-year extension of the prior agreement, but the company offered more concessions to get the "peace and stability of a longer contract," says Mr. Gordon. "Our new contract means GM can make more stable commitments to suppliers," he adds.

The contract calls for: Additional SUB, severance pay, and pension benefits; a cost of living allowance based on the consumer price index; an improvement factor averaging 7 cents an hour; a clause that says the union will accept any technical advance that tends to lower production costs.

Salt bath heat treating mechanization?

A Mechanized Desanding Operation

This fully automatic salt bath line for electrolytic desanding of gray iron castings was designed and supplied by Ajax. Dozens of other Ajax mechanized installations are used for hardening, carburizing, martempering, austempering, annealing and other heat treating processes.

72-Page Guide to Ajax Salt Baths

Write on company stationery for your copy.

AJAX HAS THE ANSWERS!

The chief product of Ajax is not simply the world's largest, most versatile line of salt bath furnaces. More particularly, it is an unmatched fund of accumulated experience in applying salt bath operations to best possible advantage. Nowhere is this more evident than in heat treating mechanization or automation.

In hundreds of installations, large and small, complete heat treating operations are handled automatically by conveyorized salt bath set-ups engineered from beginning to end by Ajax. From single in-line furnaces to elaborate combinations, each operation is automatically controlled and operated for maximum production economy and product quality.

When planning for heat treating mechanization, it pays to consult Ajax!

SEE DIP BRAZING BEING DONE!

Ajax Booth 1609 at the 40th Metal Show
(Cleveland, Ohio—Oct. 27-31)

Watch it in action, examine the results. Discuss dip brazing with any metal — or any other salt bath application — with our engineers.

AJAX

HULTGREN

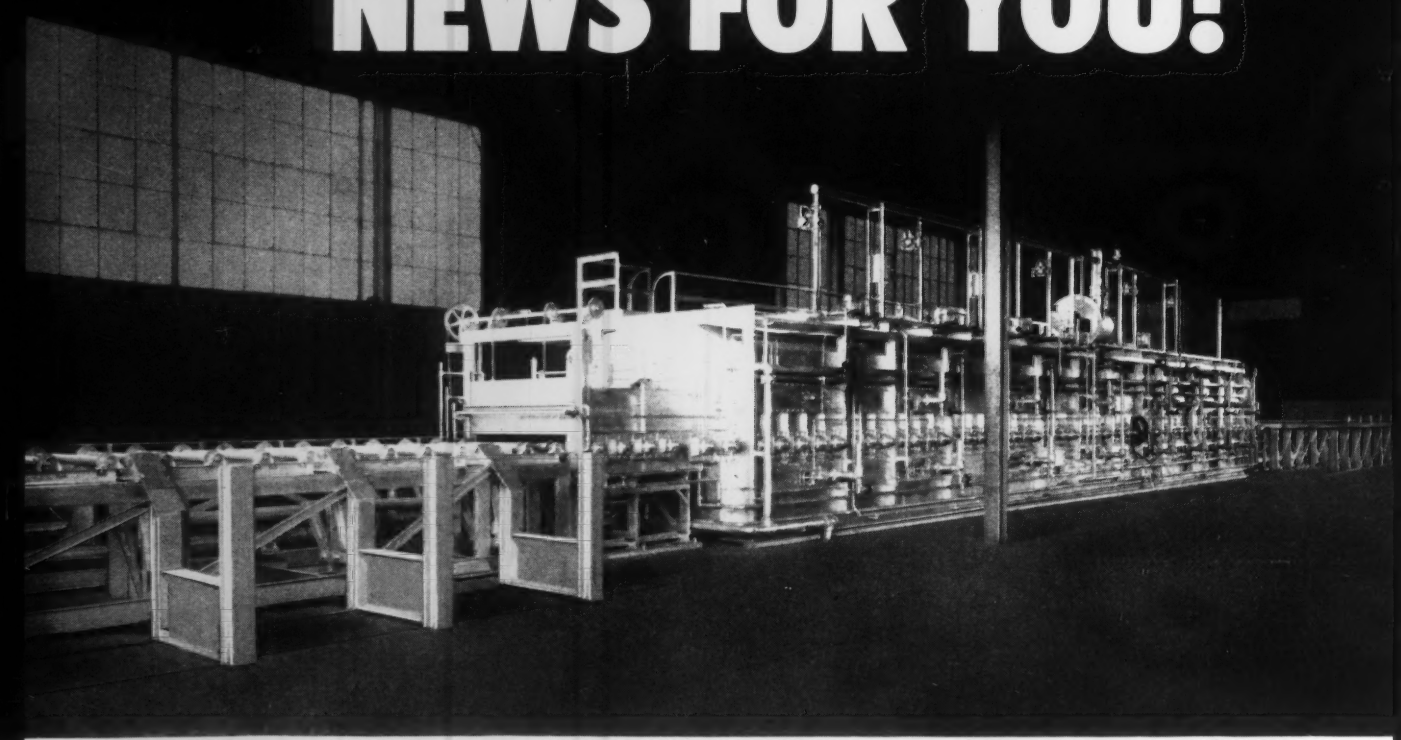
SALT BATH FURNACES

Internally heated electric and gas fired types

AJAX ELECTRIC COMPANY
952 Frankford Avenue
Philadelphia 23, Pa.

Associates: Ajax Electrothermic Corp. Ajax Engineering Corp.

NEWS FOR YOU!



positive uniformity

WITHIN EACH BAR
END TO END

THROUGHOUT THE ENTIRE SHIPMENT

The most modern **Continuous** roller hearth, radiant tube, Controlled Atmosphere Carbon Correction Furnace is now in operation at our Chicago works. Carbon Correction of decarburized surfaces can be accomplished with a suitable atmosphere during the heating cycle to provide bars for induction hardening applications.

This facility assures you of **uniform microstructure** and **uniform machining** properties.

Our metallurgical staff is always at your service to offer any assistance you may require.

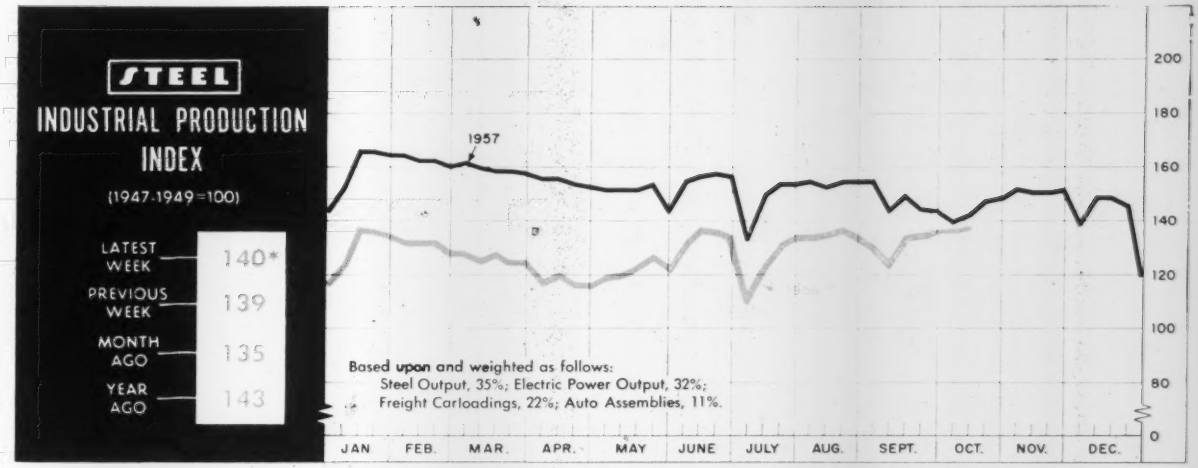
For the Ultimate in Cold Finished Carbon and Alloy Steels—specify WYCKOFF.

SPECIALISTS IN COLD FINISHED STEELS EXCLUSIVELY

WYCKOFF STEEL COMPANY

GENERAL OFFICES:
Gateway Center, Pittsburgh 30, Pa.
Branch Offices in Principal Cities
Works: Ambridge, Pa., Chicago, Ill., Newark, N.J., Putnam, Conn.

WYCKOFF STEEL PRODUCTS: Carbon, Alloy and Leaded Steels • Turned and Polished Shafting • Turned and Ground Shafting • Large Squares • Wide Flats up to 12¾" x 2¼" and 14" x 1¼" • All Types of Furnace Treated Steels



*Week ended Oct. 11.

Industrial Production Rises to 1958 Peak

INDUSTRIAL PRODUCTION finally inched up to a 1958 high during the latest period, despite persistent labor troubles in the automotive industry. During the week ended Oct. 11, STEEL's industrial production index reached a preliminary 140 (1947-49=100), after sticking at the previous peak of 139 for two weeks.

The fact that 140 was attained with somewhat less than the full support of the auto industry is a good indication that the rest of the economy is recovering at a faster clip than many observers had anticipated.

Evidence — The steel industry scheduled operations at about 74 per cent of capacity for the week ended Oct. 19. Weekly output will be nearly 2 million tons of steel for the first time since last October.

Automotive orders for steel have improved within the last few weeks, but they will not reach their peak until the assembly lines begin to consume metal at a steady pace. A large portion of the improvement comes from smaller users such as appliances, machinery, business machines, and miscellaneous metalworking products. It now looks as if the steel industry's rate will exceed the anticipated 75 per cent once motordom's labor problems are settled.

Loadings Rise Again — Freight carloadings reflect the broad base of the recovery almost as much as steel output. Discounting the normal dip over Labor Day, loadings have increased every week since the middle of August. During the week ended Oct. 4, they totaled 677,016 cars, the highest so far in 1958.

The biggest factor in the gain during the latest period was in miscellaneous carloadings, which include the bulk of metalworking's rail shipments. Undoubtedly, some of the gain is traced to shipments from suppliers to the automotive plants, which are storing parts in anticipation of full operations at any moment. But they do not include a

BAROMETERS OF BUSINESS

	LATEST PERIOD*	PRIOR WEEK	YEAR AGO
INDUSTRY			
Steel Ingot Production (1000 net tons)[2]	1,987[1]	1,933	2,070
Electric Power Distributed (million kw-hr)	12,300[1]	12,111	11,709
Bituminous Coal Output (1000 tons)	8,415[1]	8,895	9,931
Crude Oil Production (daily avg—1000 bbl)	7,050[1]	7,014	6,729
Construction Volume (*ENR*—millions)	$353.1	$495.7	$323.9
Auto, Truck Output, U. S., Canada (*Ward's*)	50,902[1]	53,567	59,746
TRADE			
Freight Carloadings (1000 cars)	672[1]	677	742
Business Failures (Dun & Bradstreet)	301	268	261
Currency in Circulation (millions)[3]	$31,352	$31,215	$31,129
Dept. Store Sales (changes from year ago)[3]	+7%	−2%	0%
FINANCE			
Bank Clearings (Dun & Bradstreet, millions)	$21,960	$21,952	$20,859
Federal Gross Debt (billions)	$276.5	$276.7	$274.1
Bond Volume, NYSE (millions)	$30.1	$29.8	$27.0
Stocks Sales, NYSE (thousands of shares)	19,105	19,228	15,576
Loans and Investments (billions)[4]	$93.6	$93.4	$87.9
U. S. Govt. Obligations Held (billions)[4]	$31.4	$31.5	$25.7
PRICES			
STEEL's Finished Steel Price Index[5]	246.65	246.65	239.15
STEEL's Nonferrous Metal Price Index[6]	208.9	202.6	209.0
All Commodities[7]	118.7	118.8	117.6
Commodities Other than Farm & Foods[7]	126.0	126.0	125.7

*Dates on request. [1]Preliminary. [2]Weekly capacities, net tons: 1958, 2,699,173; 1957, 2,559,490. [3]Federal Reserve Board. [4]Member banks, Federal Reserve System. [5]1935-39=100. [6]1936-39=100. [7]Bureau of Labor Statistics Index, 1947-49=100.

Tempilstik°

THE CRAYONS THAT TELL TEMPERATURES

IT'S THIS SIMPLE

- Select appropriate TEMPILSTIK° for the working temperature you want.
- Mark your workpiece with it.
- The TEMPILSTIK° mark melts as soon as its temperature rating has been reached.

Accuracy within 1% of rated melting point.

Also available as TEMPILAQ° (liquid form) and TEMPIL° PELLETS

63 different temperature ratings available

For information and samples, send coupon

Tempil° CORPORATION
134 West 22nd St., New York 11, N.Y.
Send information on:

☐ TEMPILSTIK° ☐ TEMPILAQ° ☐ TEMPIL° PELLETS

☐ Send booklet "How Temperatures are Measured"

☐ Send sample pellets for _____°F temperature

Name_____

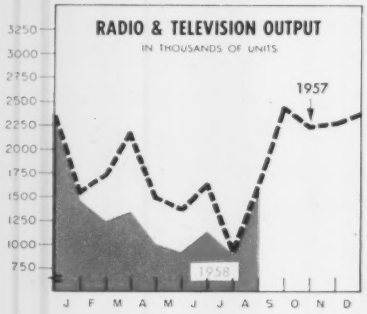
Address_____

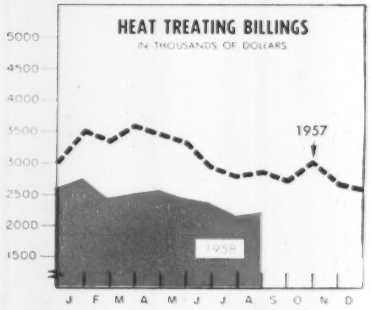
City_____

State_____

Visit our Booth #422 at the National Metal Exposition & Congress in the Cleveland Public Auditorium, October 27-31.

THE BUSINESS TREND





	Radio 1958	Radio 1957	Television 1958	Television 1957
Jan.	1,027	1,086	434	450
Feb.	878	1,265	370	465
Mar.	931	1,609	417	560
Apr.	697	1,116	303	361
May	655	1,024	267	342
June	774	1,088	377	544
July	622	613	275	360
Aug.	1,029	966	508	674
Sept.	....	1,611	...	533
Oct.	....	1,569	...	662
Nov.	....	1,689	...	575
Dec.	....	1,793	...	574
Totals	....	15,429	...	6,400

Electronic Industries Association.
Charts copyright, 1958, STEEL.

	1958	1957	1956
Jan.	2,780.4	3,533.9	3,116.4
Feb.	2,436.4	3,378.9	3,124.8
Mar.	2,495.4	3,631.8	3,330.9
Apr.	2,542.6	3,572.4	3,166.2
May	2,421.5	3,389.6	3,350.7
June	2,374.8	2,912.1	3,094.5
July	2,139.6	2,767.5	2,737.4
Aug.	2,213.0	2,830.8	3,136.6
Sept.	.....	2,708.8	2,858.6
Oct.	.....	3,021.6	3,468.5
Nov.	.....	2,641.4	3,238.2
Dec.	.....	2,565.4	2,998.9

Metal Treating Institute.

lot of full carload shipments of finished autos, usually an important factor at this period. Conclusion: Other metalworking plants are upping their movement of goods.

Utilities Hold Gains—The electric utilities are posting year-to-year gains of about 5 per cent in weekly output. The improvement has been going on for several months, even when the auto companies were in the depths of model changeovers. Part of the relative improvement reflects the decline which began in last year's fourth quarter, but sizable plusses in the important Central Industrial Div. indicate that manufacturing schedules are being beefed up.

Uptrend Sets Fast Pace

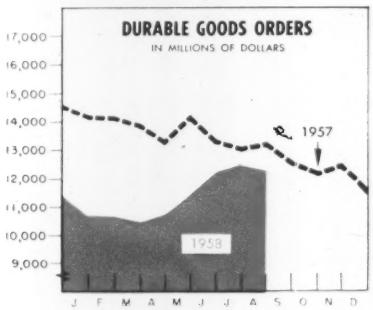
The Chase Manhattan Bank, New York, also feels that the recovery has exceeded expectations, but warns that capacity industrial operations may not be attained in the near future. It feels that consumer markets, while basically strong, are far from what they could be. Overcapacity and substantial unemployment are still weighty problems. "With normal growth in productivity, a 10 per cent rise in gross national product in 1959 would be required to fully utilize our resources. In contrast, the average annual growth in GNP for the last decade works out to less than 4 per cent in constant dollars."

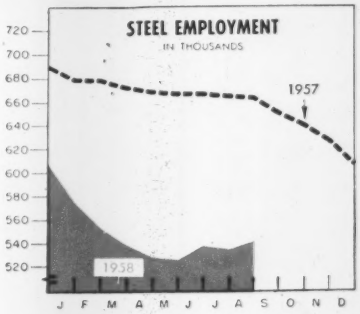
However, the bank points out that recent studies indicate that most of today's idle capacity is due to the recession rather than to overbuilding. "Revival in demand could lead to renewed expansion next year, although at a lower rate than in 1955-57."

The Guaranty Trust Co. of New York feels that the revival in demand in the third quarter added about $10 billion to the annual rate of the gross national product, and that the pressure is continuing unabated during this quarter. "It already seems reasonable to anticipate the GNP will regain its peak of $445.6 billion by the end of this year or early in 1959."

Auto Output: 6 Million?

One of the big ifs in the forecast for 1959 is the auto industry. James M. Dawson, vice president and economist for Cleveland's National City Bank, is optimistic about this sector of the economy. He points out that the consensus so far is for sales of about 5.6 million cars





	New Orders* 1958	New Orders* 1957	Sales* 1958	Sales* 1957
Jan.	10,704	14,176	12,646	14,941
Feb.	10,688	14,102	12,038	14,808
Mar.	11,488	13,853	11,670	14,198
Apr.	10,833	13,234	11,532	14,254
May	11,423	14,115	11,643	14,296
June	12,245	13,249	12,086	14,207
July	12,512	13,005	12,256	14,573
Aug.	12,292†	13,160	12,371†	14,297
Sept.	.....	12,519	.....	14,132
Oct.	.....	12,154	.....	13,932
Nov.	.....	12,434	.....	13,548
Dec.	.....	11,399	.....	13,092

*Seasonally adjusted. †Preliminary.
U. S. Office of Business Economics.

	Employment in Thousands 1958	Employment in Thousands 1957	Payroll in Millions 1958	Payroll in Millions 1957
Jan.	575	678	$297.4	$360.4
Feb.	554	677	261.7	327.5
Mar.	539	671	271.8	344.2
Apr.	529	668	259.1	331.5
May	527	666	270.1	338.0
June	538	666	278.6	324.8
July	536	665	280.1	334.6
Aug.	542	663	296.4	343.7
Sept.	....	651	....	330.1
Oct.	....	640	....	345.6
Nov.	....	626	....	316.3
Dec.	....	606	....	299.6

American Iron & Steel Institute.

and production of about 5.3 million next year. "Unfortunately, history teaches that the consensus probably will be wrong. From 1955 through 1958, the forecasts were right in direction but underestimated in magnitude."

During seven recoveries since 1922, auto output has expanded an average of 36 per cent. Applying that yardstick to 1959, Mr. Dawson comes up with a possible output of 6 million units. Using the "normal" proportion of consumer income devoted to cars over the period of year, sales could be 6.2 million units, production 5.9 million. Mr. Dawson's own guess: Production of 5.8 million units, a 30 per cent improvement over 1958. (For STEEL's roundup on autos, see Page 125.)

Employment Recovering

Employment has been influenced significantly for the first time since the recovery started in May. The mid-September report of the Departments of Labor and Commerce shows that unemployment fell to 4.1 million workers, the lowest level of the year. The decline of nearly 600,000 was about twice the usual September drop and brought the seasonally adjusted rate of unemployment to 7.2 per cent from August's high point of 7.6 per cent.

Total employment dipped to 64.6 million because of the withdrawal of students from the labor market. But payrolls in manufacturing moved counter to the general trend and advanced 240,000, mostly in durable goods.

Both the workweek (39.8 hours) and the average weekly pay of factory workers ($85.17) gained. The pay figure is a record.

Trends Fore and Aft

- The September business report of the Purchasing Agents Association of Chicago shows that delivery time is lengthening; prices are still rising; inventory reduction is leveling out; employment is climbing; production is growing stronger; backlogs are increasing; profits are rising; buying policy is lengthening.
- Frigidaire Div. of General Motors Corp. is recalling 350 workers to its Dayton, Ohio, plant, bringing to 1600 the number called back since Aug. 1.
- Radio and television set production reached the highest levels of the year in August, says the Electronic Industries Association. (See graph and table, Page 144.)

speedy fastener service

RIVETS • NAILS
THREADED PARTS

In Between Sizes • Lengths to 7 Inches • Close Tolerances • Special Heads • Any Metal including Monel • Inconel • Stainless

FAST DELIVERY...
SHORT or LONG RUNS...
DESIGN ASSISTANCE

Over 250 wire sizes in stock—from .024" up to 3/8" diameter—in 30 alloys . . . all geared to meet your requirements quickly to our usual high quality standards.

MANUFACTURERS
SINCE 1850

SPECIAL NAILS RIVETS SCREWS
Hassall

JOHN Hassall INC.
P. O. Box 2269, Westbury,
Long Island, New York

Whatever you need in silver you can find at the

HANDY & HARMAN SILVER SUPERMARKET

Special today—and every day—silver in every form and grade you can name. By the ounce, inch, foot, and every other measure known to man.

All are of the consistent quality that has made—and kept—Handy & Harman first in the manufacture and development of silver and silver alloys for industry.

At the right are some of the general forms of silver made by Handy & Harman (what you don't see, ask for):

- Fine Silver (wire, strip and foil)
- Silver Anodes and Grain for plating
- Silver Contact Alloys
- Silver Powders
- Silver Flake and Paint
- Silver Brazing Alloys
- Silver Electronic Solders
- Silver Sintered Metals
- Solder-Flushed Silver Alloys
- Silver Chloride and Oxide
- Coin Silver (wire and strip)
- Silver Bi-Metals
- Gold, Platinum and other precious metals also available in every form you need

VISIT OUR BOOK DEPARTMENT

We have five Technical Bulletins giving engineering data on the properties and forms of Handy & Harman Silver Alloys. We would like you to have any or all of those that particularly interest you. Your request, by number, will receive prompt attention.

Fine Silver	Bulletin A-1
Silver-Copper Alloys . .	Bulletin A-2
Silver-Magnesium-Nickel	Bulletin A-3
Silver Conductive Coatings	Bulletin A-4
Silver Powder and Flake .	Bulletin A-5

Your NO. 1 Source of Supply and Authority on Precious Metal Alloys

HANDY & HARMAN — FOUNDED 1867 — QUALITY • SERVICE

HANDY & HARMAN

General Offices: 82 Fulton St., New York 38, N. Y.

OFFICES AND PLANTS
ATLANTA, GA.
BRIDGEPORT, CONN.
PROVIDENCE, R. I.
CHICAGO, ILL.
CLEVELAND, OHIO
DETROIT, MICH.
LOS ANGELES, CALIF.
OAKLAND, CALIF.
TORONTO, CANADA
MONTREAL, CANADA

SAMUEL W. GEARHART JR.
Birdsboro chief metallurgist

ALBERT P. GAGNEBIN
Inco vice president

HAROLD L. ELFENBEIN
Parker-Kalon marketing dir.

B. YALE MAGEOCH
Delta-Star eng.-research dir.

Samuel W. Gearhart Jr. was promoted to chief metallurgist at **Birdsboro Steel Foundry & Machine Co.**, Birdsboro, Pa. He was metallurgical consultant and sales engineer.

Albert P. Gagnebin was elected a vice president, **International Nickel Co. Inc.**, New York. He became manager of the nickel sales department in 1956, and was elected an assistant vice president in 1957. **Joseph M. Weldon** was made an assistant vice president.

Eric K. Foss was made operating assistant to the executive vice president of **Copperweld Steel Co.**, Warren, Ohio. He was assistant chief metallurgist, A. M. Byers Co.

Earl V. Pierce was appointed sales manager, Kenosha, Wis., division, **American Brass Co.** He was assistant sales manager.

C. V. Blackburn was elected executive vice president, **Stran-Steel Corp.**, division of National Steel Corp., Detroit. He was vice president-sales. **Julius G. Skaaren**, former manager of building sales, was named general sales manager, and is replaced by **George R. Thomas. Max Luft** was named marketing service manager.

Lewis C. Black was made manager of domestic sales, **Bucyrus-Erie Co.**, Milwaukee. He was manager of sales for large excavators.

Kenco Mfg. Co., Los Angeles, appointed **Robert Linville** vice president-marketing. He was vice president-sales for Burgmaster Corp.

Harold L. Elfenbein was made marketing director, **Parker-Kalon Div.**, Clifton, N. J., General American Transportation Corp. He retains the position of advertising manager.

Ernest Willison was made engineering manager; **Donald A. Booth**, assistant engineering manager for Engineering Works Div., **Dravo Corp.**, Pittsburgh.

Louis F. Fontana was elected a vice president and made general sales manager of **Irving Subway Grating Co. Inc.**, Long Island City, N. Y. He was sales manager.

Raymond O. Hallberg was elected vice president-operations, **Wilbur B. Driver Co.**, Newark, N. J.

Zalk Steel & Supply Co., Minneapolis, named **Joseph F. Kasal** manager of its new forging and manufacturing division. He was purchasing agent for Grain King Industries.

Felton H. Havins was named director of sales engineering for **Anadite Inc. of Texas**, Hurst, Tex. He was chief project engineer of Brunswick-Balke-Collender Co.

Donald C. Suhr was elected president of **Hurd Lock & Mfg. Co.**, Detroit. He was vice president in charge of manufacturing for Allen Industries Inc.

William W. Moore was elected vice president-sales, **Research - Cottrell Inc.**, Bound Brook, N. J. He was New York district sales manager.

Delta-Star Electric Div., Chicago, H. K. Porter Company Inc., appointed **H. Yale Mageoch** director of engineering and research; **Allan K. Alsaker**, chief engineer at the Chicago Works; **R. W. Dixon**, manager of the Electric Service Works, Philadelphia, and **C. R. Billman**, assistant manager there.

Gordon C. Curry was appointed vice president-sales, **Dollin Corp.**, Irvington, N. J. He was sales manager. Prior to joining Dollin early this year, Mr. Curry was general sales manager of Ainsworth-Precision Casting Co.

Daniel O'Madigan Jr. was made general sales manager of the new auto parts division of **Saco-Lowell Shops** at Detroit. He is assisted by **Anthony L. Barclae.** Mr. O'Madigan was director of sales for Studebaker-Packard Corp.

Nelson G. Spoth was named manager of **Kolcast Industries**, Cleveland, division of Thompson Products Inc. He succeeds **Lewis R. Shilling**, founder of Kolcast, who resigned to become president of Gerson Stewart Corp., Cleveland.

Donald G. Jenson was named assistant chief engineer, in addition to engineering adviser, in the new cryogenics division, **Standard Steel Corp.**, Los Angeles. **Donnel M. Browne** was appointed manager, quality control department of the division. **Lloyd W. Sawyer**, former assistant purchasing agent, was made head of material control. **Jack K. Tedrahn** was named assistant to the purchasing agent. **Edwin R.**

DAN W. BURNS

ROBERT T. CAMPION

Siegler Corp. vice presidents

C. J. PETRY

P. W. COFFMAN

Acme Steel superintendent posts

Harvey was promoted to purchasing expediter.

Dan W. Burns and **Robert T. Campion** were elected vice presidents, **Siegler Corp.**, Los Angeles. Earlier this year, Mr. Burns was named president of Hufford Corp., subsidiary in El Segundo, Calif. Mr. Campion will continue as secretary.

Charles R. DeCarlo was appointed manager of marketing and service, Data Processing Div., White Plains, N. Y., **International Business Machines Corp.** Reporting to Dr. DeCarlo are: **Clark Garrison Jr.**, made sales manager; **Robert H. Howe**, data processing director of sales administration; **Charles C. Smith**, who was made director of marketing programs.

W. S. Hyler was made technical assistant to the vice president-research at **Huck Mfg. Co.**, Detroit. He had been with Battelle Memorial Institute.

Charles J. Janosek, former factory manager, was made works manager, **Cleveland Welding Div.**, American Machine & Foundry Co. **Charles Bill Jr.** was made administrative assistant to the general manager.

Clare Engle was made superintendent of manufacturing; **George Diggles**, manager of production engineer, **Hydreco Div.**, Kalamazoo, Mich., New York Air Brake Co.

John Haniak joined the nuclear design group of **Vard Inc.**, Pasadena, Calif.

Firth Sterling Inc., Pittsburgh, appointed **W. W. Wellborn** technical director, carbide division.

C. J. Petry was made general superintendent; **P. W. Coffman**, assistant general superintendent of **Acme Steel Co.**, Chicago. Mr. Petry joined Acme Steel in 1957 as assistant to the chairman. He previously was superintendent of the Worcester, Mass., plant of American Steel & Wire Div., U. S. Steel Corp. Mr. Coffman was superintendent of Acme's cold mill division.

James H. Richardson was made manager, product development department, **Wickwire Spencer Steel Div.**, Buffalo, Colorado Fuel & Iron Corp. He previously served as a contact metallurgist for the company's general wire sales department in Buffalo.

McLouth Steel Corp., Detroit, appointed four vice presidents: **H. B. Warner**, former plant manager of the Trenton and Gibraltar plants, was made vice president-operations. **Lyle H. Johnson** was made vice president-engineering; **George W. Tischer**, vice president-sales; **Robert C. McLaughlin**, vice president-public relations and assistant to the president.

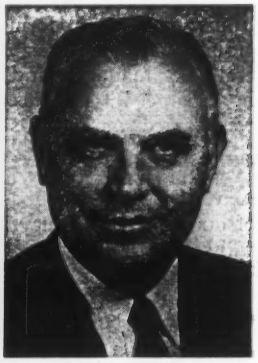
Eugene G. Painter was appointed co-ordinator of production control at **Allegheny Ludlum Steel Corp.**, Pittsburgh. Formerly assistant co-ordinator, he succeeds **W. R. Yingst**, recently made manager of the company's West Leechburg, Pa., Works.

E. J. Thomas was elected chairman, **Goodyear Tire & Rubber Co.**, Akron. He continues as chief executive officer. **P. W. Litchfield**, former chairman, becomes honorary chairman. **Russell DeYoung**, executive vice president, succeeds Mr. Thomas as president. Vice President **Sam DuPree** moves up from co-ordinator of company general managers to vice president-production, and is replaced by **Richard A. Jay**.

Wheeling Corrugating Co., subsidiary of Wheeling Steel Corp., appointed **James A. McQuilkin** manager of the Columbus, Ohio, branch to succeed **Gilbert M. Long**, who

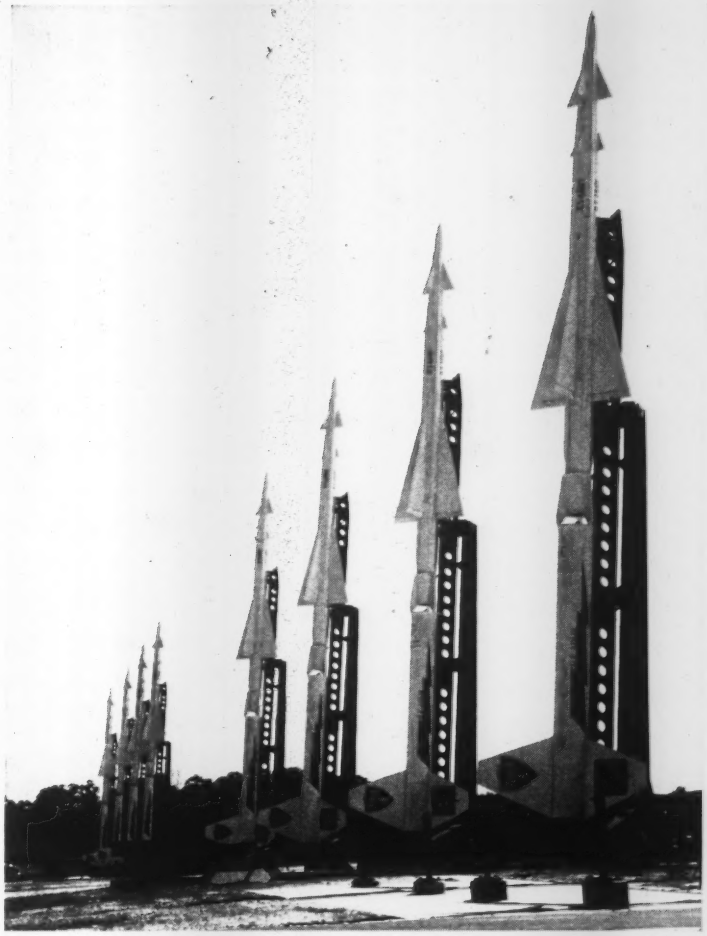
H. B. WARNER

LYLE H. JOHNSON



GEORGE W. TISCHER

McLouth Steel appoints vice presidents



New job for HOUGHTO-SAFE fluids

. . . where hydraulic safety and dependability are absolute "musts" for missiles and men

One of the things that helps produce these dramatic moments is hydraulic equipment—moving the missile, setting it up, and holding it while it is readied for flight.

As in everything else in the world of missilery, only the best in hydraulics is good enough. That's why you'll find Houghto-Safe fire-resistant hydraulic fluids in many such critical military and defense applications.

And this same safety and dependability are your goals in industry too. Houghton can help you get both. Its fire-resistant hydraulic fluids are available for many different applications, in water-glycol, phosphate-ester and oil-emulsion types.

You can specify Houghto-Safe with confidence, because it is backed by years of hydraulic experience and complete engineering service. To obtain this service, simply give us the conditions under which the fluid is to be used. You will get unbiased recommendations, with no obligation. Write E. F. Houghton & Co., 303 West Lehigh Avenue, Philadelphia 33, Penna.

HOUGHTO-SAFE

. . . a product of

E. F. HOUGHTON & CO.

PHILADELPHIA · CHICAGO · DETROIT · SAN FRANCISCO

Ready to give you on-the-job service . . .

A. S. AULT
Chicago Vitreous president

PAUL G. THAYER
Bendix-Westinghouse chief eng.

JOHN S. SMART Jr.
gen. sales mgr. of Asarco

transferred to the general offices in Wheeling, W. Va., as general sales manager.

A. S. Ault, vice president-general manager, **Chicago Vitreous Corp.**, Cicero, Ill., division of Eagle-Picher Co., was elected president. **William Hogenson**, president, and **Emanuel Hogenson**, executive vice president, will retire Nov. 30.

Robert S. Wright was named president of **USI International**, division of U. S. Industries Inc., New York. He was with a division of Olin Mathieson Chemical Co.

Raymond W. Young was made assistant to the manager, Middletown, Ohio, fabricating plant, **Armco Steel Corp.**

Dr. T. M. Stout was named manager, process applications department, engineering division, **Thompson - Ramo - Wooldridge Products Co.**, Los Angeles.

J. A. Sulzmann was made Cleveland district sales manager, **Upson-Walton Co.** He will continue as manager of the Pittsburgh district sales office.

William F. Steiner was made sales manager, **Payne Co.**, La Puente, Calif. He was assistant sales manager.

Martin L. Givot joined **Industrial By-Products Inc.**, Chicago, as vice president in charge of steel mill product sales.

Robert Hughes was appointed director of research and development, **Dravo Corp.**, Pittsburgh, replacing **W. L. Newhall**, retired. **Dr. John A. Anthes** was named assistant director.

Paul G. Thayer was made chief engineer of the advance development department, **Bendix - Westinghouse Automotive Air Brake Co.**, Evansville, Ind. He was chief engineer of Brunner Co., Gainesville, Ga., a division of Dunham-Bush.

John S. Smart Jr. was appointed general sales manager, **American Smelting & Refining Co.**, New York. **Ralph L. Wilcox** was named assistant sales manager. Mr. Smart was assistant director of research.

David M. Diltz was made assistant to the vice president-sales, **American Metal Products Co.**, Detroit. He was vice president-sales, Rheem Automotive Co., division of Rheem Mfg. Co.

Crucible Steel Co. of America, Pittsburgh, named as assistant product managers: **Herbert J. Arnold**, stainless bars, wire and billets; **Thomas G. Davis**, flat rolled stainless products.

Dr. Martin Schilling, Army missile scientist, joined **Raytheon Mfg. Co.'s** missile systems division as programs manager and director of advanced development. He resigned as chief, projects management staff, research and development division, Army Ordnance Missile Laboratories, Redstone Arsenal.

Thomas E. Douglass was made assistant to the president, **Simonds-Worden-White Co.**, Dayton, Ohio. He was with Vernay Laboratories.

Peter H. Morganson was appointed assistant chief engineer of **Veeder-Root Inc.**, Hartford, Conn.

Norby Putlak, former production manager, was promoted to service manager of **Midland Screw Corp.**, Chicago.

Charles L. Williams was elected president, **Richmond Steel Co.**, Richmond, Va. He succeeds his brother, **Carter N. Williams**, now chairman. Another brother, **Thomas N. Williams**, was elected executive vice president.

Johan C. H. Larsen was elected vice president-sales, **Adalet Mfg. Co.**, Cleveland. He was assistant sales manager.

Clemens A. Tarter was appointed superintendent of **Kaiser Steel Corp.'s** tin mill, Fontana, Calif. He succeeds **William B. Keirn**, now consultant for the tin mill.

McKnight Kinne was appointed assistant to the director of general purchasing of **Armco Steel Corp.**, Middletown, Ohio.

Warner Electric Brake & Clutch Co. appointed **Robert W. Vierck** Chicago district manager; **Earl A. Venstrom**, metropolitan New York district manager, industrial products division.

OBITUARIES...

V. A. Crosby, manager of automotive development for **Climax Molybdenum Co.**, New York, division of American Metal Climax Inc., died Oct. 2.

Hyman J. Lavner, 62, former executive director, purchasing department, **Westinghouse Electric Supply Co.**, Syracuse, N. Y., died Oct. 1.

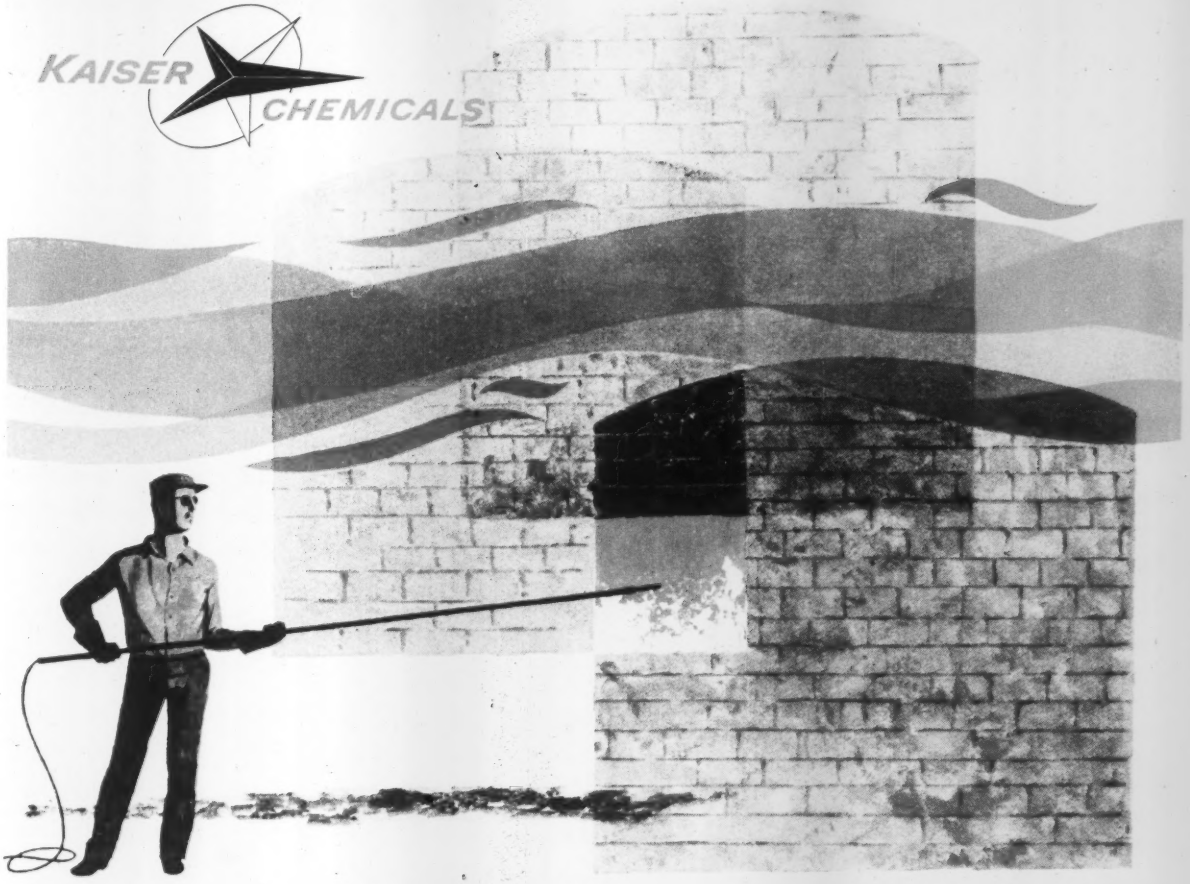
Lewis W. Stafford, 54, former sales manager, western division, **Toledo Steel Products Co.**, Toledo, Ohio, died Oct. 1.

George H. W. Stone, 65, vice president, **Endicott Forging & Mfg. Co.**, Endicott, N. Y., died recently.

Paul Diserens, 76, retired director of research and engineering construction for **Worthington Corp.**, Harrison, N. J., died Oct. 6.

Felix S. Dreyer, 53, president of **Lewin Mathes Co.**, St. Louis, division of Cerro de Pasco Corp., died Oct. 8.

KAISER CHEMICALS



3 Campaigns with open hearth endwalls of Kaiser Periclase Chrome Brick!

• "Took off #6 Open Hearth and found Kaiser Periclase Chrome Brick looked so good in the endwalls that they were left in for the third campaign."

• "After two campaigns of 90 and 106 heats, Brand 'A' were removed from the down-river end and Kaiser Periclase Chrome Brick are going to complete a third campaign in the up-river end."

• "Furnace this month finished third campaign of 176 heats, and at that time Kaiser Periclase Chrome endwall had gone through 562 heats. At this writing, this endwall has approximately 600 heats..."

Every month reports like these bring more and more dramatic evidence of improved endwall service. And more often than not, these reports show how *new shop records* have been established with Kaiser Periclase Chrome Brick. Here are the properties that make possible such performance:

1. Volume Stability. Chromite content is the minimum amount necessary to provide resistance to thermal shock. Lowering of chromite also reduces swelling in presence of iron oxide, thus minimizes buckling and peeling.

2. Uniform High Strength because ceramic bond is formed *before* the chemical bond burns out.

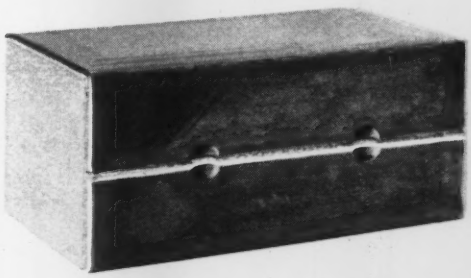
3. Outstanding Resistance to Distortion and Shrinkage because there is no liquid phase in the conversion from chemical to ceramic bond.

4. Excellent Resistance to Chemical Attack by furnace fumes, iron oxides and slags is assured by high magnesium content, maximum brick density (low porosity) and chemically stable composition.

Make a comparison test and see how much more life you get with Kaiser Periclase Chrome Brick. Your Kaiser Chemicals Sales Engineer will be glad to help.

Call or write Kaiser Chemicals Division, Dept. S8241, Kaiser Aluminum & Chemical Sales, Inc., at any of the regional offices listed below:

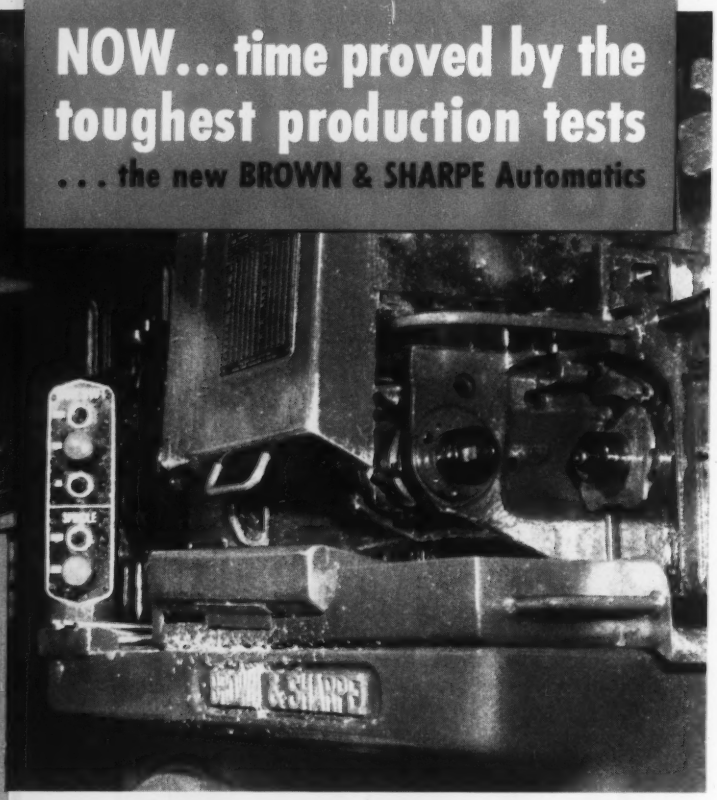
PITTSBURGH 22, PA. . . . . 3 Gateway Center
HAMMOND, IND. . . . . 518 Calumet Building
OAKLAND 12, CALIF. . . . . 1924 Broadway

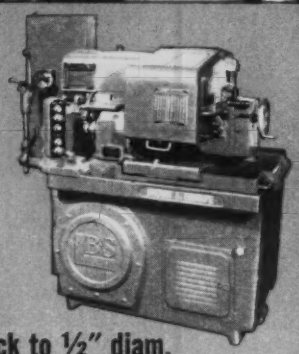


Refractory Brick & Ramming Materials • K/R Gunning Systems
Castables & Mortars • Magnesite • Periclase • Deadburned Dolomite • Aluminas

NOW...time proved by the toughest production tests

. . . the new BROWN & SHARPE Automatics





No. 00

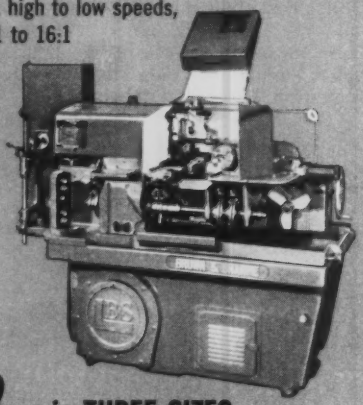
takes stock to ½" diam.

Spindle speed range 7200 to 34 rpm

Turns any length to 1"

. . . with optional equipment, to 1½"

Ratios, high to low speeds, 2.3:1 to 16:1



No. 2 — in THREE SIZES

Take stock to	¾" dia.	1¼" dia.	1½" dia.
Spindle speed range	5050 to 25 rpm	3500 to 17 rpm	2450 to 17 rpm

Turn any length to 3½"

Ratios, high to low speeds, 2.2:1 to 15:1

Day by day, more in-plant records prove the production possibilities of the new No. 00 and No. 2 Brown & Sharpe Automatic Screw Machines.

"33% higher production . . ."

One manufacturer boosted production from 257 to 342 pieces per hour. The 33% gain includes a reduction in drilling time of 15%, using the improved deep drilling arrangement.

"Save up to 92% in production time"

Another manufacturer, by eliminating secondary operations necessary with old machines, saves up to 92% in production time, and meets the highest standards for surface quality.

"tolerances held to .0005" – rejects to 1%"

From every aspect — accuracy, efficiency, economy — the new Automatics are *delivering* the advantages Brown & Sharpe designed into them.

Figure the comparable savings you can make in your operations with the extra speed, precision, adaptability — the easier setups and extended tool life. You'll see why so many buyers say, "They pay for themselves in record time." For complete details, write: Brown & Sharpe Mfg. Co., Providence 1, R. I.

PROGRESS IN PRECISION FOR 125 YEARS

Brown & Sharpe

MILLING, GRINDING, AND SCREW MACHINES • MACHINE TOOL ACCESSORIES
PRECISION TOOLS • HYDRAULIC PRODUCTS • CUTTERS

R&D Maintain High Ratings

Most companies surveyed by NICB will spend as much or more this year for research than in '57. Programs are regarded as essential by many. Look for expansion

EXPENDITURES for research and development in 1958 will equal or exceed 1957 totals among a large majority of companies cooperating in a National Industrial Conference Board survey. Plans to "expand the research program in the years ahead" were frequently reported.

Allocations — The respondents budget most of their funds for applied research and development work. A relatively small sum goes for basic research—but more than half the 159 firms reporting on their allocations do some work of this type.

Eighty-nine respondents include miscellaneous projects (such as quality control, product services, and technical information) in their research expenditures. Other companies did not put such items in their R&D budgets.

Boom—Most firms regard research as an essential function. As one company president observes: "We cannot exist without research."

You can get a good idea of the size and scope of R&D activities by looking at these examples of current projects:

Electric Storage Battery Co., Philadelphia, opened a research center at Yardley (Trenton), N. J., to probe a wide range of related scientific subjects—from packaged power sources to artificial organs for medical use.

International Minerals & Chemical Corp. opened its $5-million administrative and research center in Skokie, Ill.

Diamond Alkali Co., Cleveland, plans to build a multimillion dollar research center a few miles south of Painesville, Ohio.

Allis-Chalmers Mfg. Co. Milwaukee, completed construction of new engineering, development, and research facilities at Greendale, Wis. Among the projects to be undertaken will be design, construction, and testing models, mock-ups, and prototypes of nuclear reactors and associated equipment.

Crane Co., Chicago, organized a subsidiary, **Corwith Corp.**, to handle government sponsored research and development work. Dr. Maurice Nelles is president of the subsidiary; John Magos, acting general manager. Assignments will include airplane and guided missile launching systems and liquid flow control.

Sylvania Electric Products Inc., New York, opened its 48,000 sq ft laboratory at Towanda, Pa. It does research, engineering, and product development in many areas of metallurgy and chemistry, including phosphors and semiconductor materials.

Plans Service Laboratory

Union Carbide Chemicals Co., division of Union Carbide Corp., New York, is building a Technical Service Laboratory at Eastview (Tarrytown), N. Y. The general contract has been awarded to George A. Fuller Co., New York.

Vacuum System Unveiled

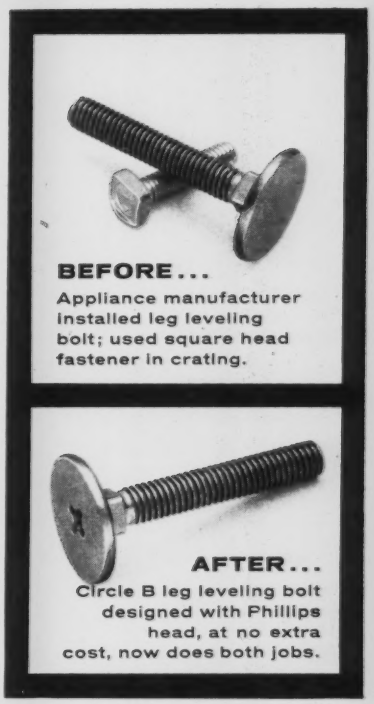
Erie Forge & Steel Corp., Erie, Pa., put its new vacuum chamber system for the pouring of steel ingots into operation on Sept. 18. This new equipment and a 75-ton electric furnace installed last July are part of a $6-million improvement program.

Improves Strip Facilities

Brass strip tailormade to specifications is being produced by Riverside-Alloy Metal Div., H. K. Porter Company Inc., Riverside, N. J. The recently revamped mill has produced brass strip up to 14 in. wide and as thin as 0.005 in.

Steel Distributor Expands

Southwestern Ohio Steel Inc., Hamilton, Ohio, is expanding. The first step will be erection of two buildings on property adjacent to the present facilities. They will be equipped with 10 and 20 ton cranes and will be devoted to steel



save dollars

with this sense-making idea

LITERALLY thousands of dollars can be saved through the practical application of basic bolt making principles in designing and specifying fasteners.

In the actual case shown, savings were pyramided through reduced inventory, handling, purchasing and production time; while one part was eliminated entirely.

To make this basic information available, Buffalo Bolt Company has drawn on over 100 years of experience to put together a digest of these principles.

You'll find them in our new booklet, "How to specify fasteners . . . and save". Filled with drawings and charts, it makes a handy guide in designing or buying any headed parts. If you can use a copy, write to North Tonawanda or ask a Field Representative.

BUFFALO BOLT COMPANY

Division of Buffalo-Eclipse Corporation

N. Tonawanda, N. Y., Princeton, Ill.

MAKING BOTH FASTENERS AND FRIENDS FOR 100 YEARS

• *3 convenient service centers*

WESTERN OFFICE
Chicago, HArrison 7-2178
EASTERN OFFICE
New York City, REctor 2-1888
CENTRAL OFFICE
North Tonawanda, JAckson 2400
(Buffalo)

coil storage and processing operations. An additional coil slitting line and automatic conveyor will be installed. The 72-in. wide automatic cutoff line will be redesigned and automatic gaging and stacking equipment will be added.

McDanel Expands Facilities

McDanel Refractory Porcelain Co., Beaver Falls, Pa., maker of industrial ceramics, has expanded its facilities for the manufacture of large ceramic tubes. (They're for radiant type heat treating furnaces.) The firm can now make tubes 72 in. long and 1 to 4 in. in diameter.

ASSOCIATIONS

Albert M. Nutter, E. L. LeBaron Foundry Co., Brockton, Mass., was elected president of the **Gray Iron Founders' Society,** Cleveland, to succeed J. Scott Parrish Jr., Richmond Foundry & Mfg. Co. Inc., Richmond, Va. Other officers are: Vice president, J. E. Quest, Quest Mfg. Co., Shakopee, Minn.; secretary, W. A. Hepburn, John T. Hepburn Ltd., Toronto, Ont.; and treasurer, C. R. Garland, W. O. Larson Foundry Co., Grafton, Ohio.

Glenn B. Warren, vice president and consulting engineer of the Turbine Div., General Electric Co., Schenectady, N. Y., was elected president of the **American Society of Mechanical Engineers,** New York.

National Ornametal Iron Manufacturers Association, Memphis, Tenn., appointed B. L. Hairston executive secretary.

CONSOLIDATIONS

Hevi-Duty Electric Co., Milwaukee, purchased **Stroman Furnace & Engineering Co.,** Franklin Park, Ill., from the Peterson Oven Div. of Baker-Perkins Inc., Saginaw, Mich. Furnaces formerly produced by Stroman will be manufactured in Hevi-Duty's plant at Watertown, Wis.

Duralite Window Corp., Knoxville, Tenn.; **Bennel Inc.,** Lindenhurst, N. Y., and its affiliated companies; and the **Knox Metal Products Div.** of Penn-Michigan Mfg. Corp., West Lafayette, Ohio, have merged. The consolidated firm is American Duralite Corp. and will make aluminum building products at a plant in Loudon, Tenn.

Landis Tool Co., Waynesboro, Pa., acquired **John Lund Ltd.,** Cross Hills, England, manufacturer of grinding and boring machines. The British subsidiary (Landis-Lund Ltd.) will continue its present lines and will make the special and semi-special grinding machines now produced by Landis and its subsidiary, Gardner Machine Co., South Beloit, Ill.

NEW PLANTS

Timken Roller Bearing Co., Canton, Ohio, has completed a warehouse at its Gambrinus (Ohio) plant for storage and distribution of specialty steel products carried in stock by the Steel & Tube Div. Estimated cost of the new facility: $275,000.

Crucible Steel Co. of America, Pittsburgh, formally opened its specialty steel warehouse and sales office at 31400 Aurora Blvd., Solon, Ohio. Fred H. Thoke is manager, succeeding J. F. O'Hara who is now assistant eastern regional manager in New York.

Pratt & Whitney Co., West Hartford, Conn., completed a precision tool warehouse adjoining its Sterling Die Div. plant at 13811 Enterprise, Cleveland, Ohio. Herbert Yankee, Pratt & Whitney vice president and manager of Sterling Die, is in charge of the Cleveland warehouse operation.

Standard Steel Co., Los Angeles, opened new manufacturing and engineering facilities adjacent to the firm's main plant. It will fabricate rocket fuel tanks (low temperature, vacuum bottle type) for the missile industry.

Brown-Wales Co., Cambridge, Mass., will lease a warehouse and office building to be constructed at Auburn, Mass. This firm is a distributor of bars, bar shapes, plates, structurals, sheets, alloy and stainless steels. Other firms that will be situated in this new industrial park area are: **Montrose Products Co.** (plastic covered wire) and **Lodding Engineering Corp.** (machinery).

REPRESENTATIVES

Warehouse Div., Atlantic Steel Co., Atlanta, has been appointed a distributor for Olin Aluminum by **Metals Div., Olin Mathieson Chemical Corp.,** New York.

Acme Chain Corp., Holyoke, Mass., appointed Potter & Dugan Inc., Buffalo, as its representative for western New York.

NEW ADDRESSES

Metals Div., Olin Mathieson Chemical Corp., moved its Cincinnati sales office to larger quarters at 1216 E. McMillan. The office houses the Olin Aluminum regional and district sales staff and the Western Brass sales staff.

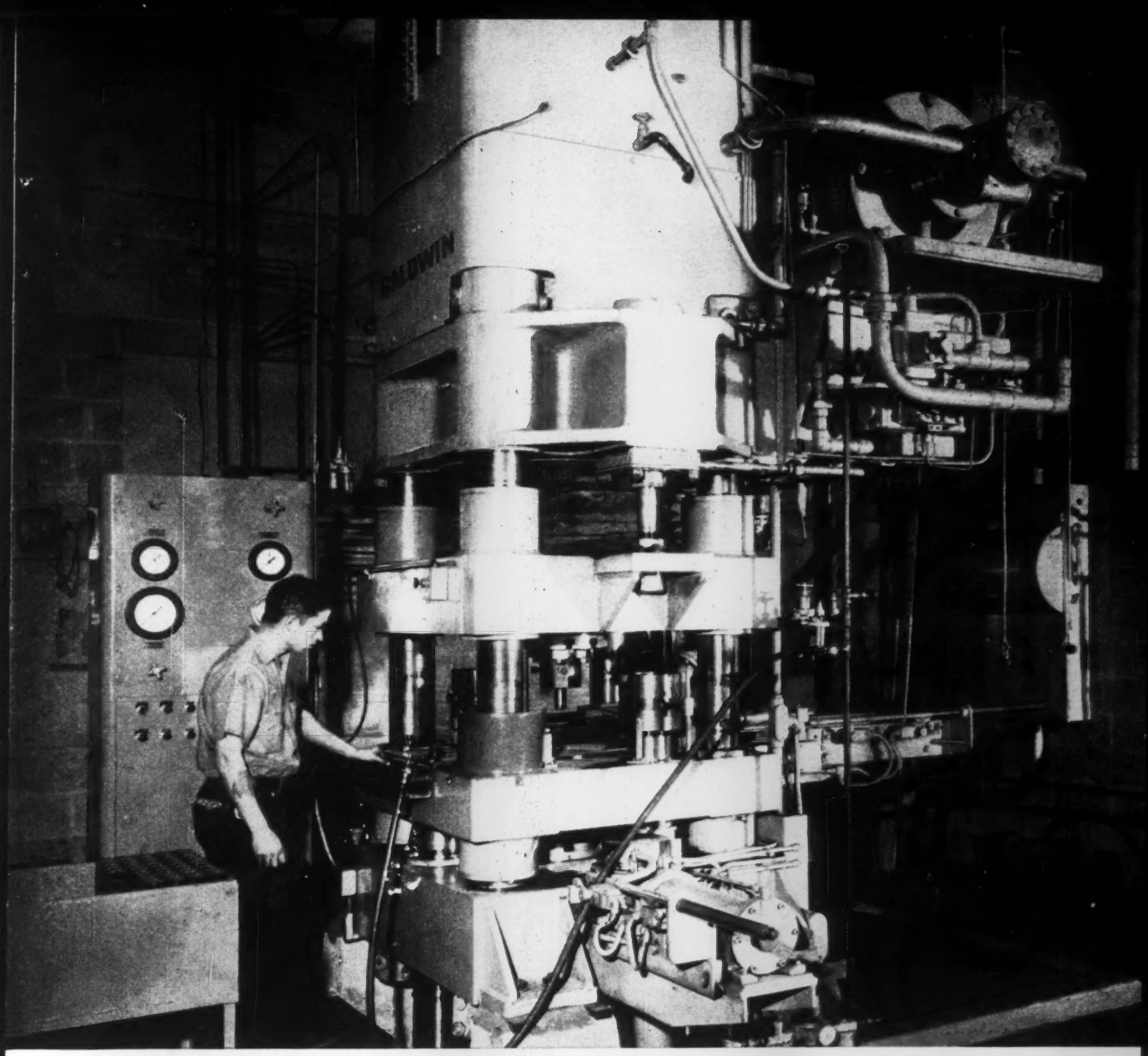
Exide Industrial Div., Electric Storage Battery Co., moved its Washington branch office to 4000 Albemarle N.W. J. A. Klingensmith is branch sales manager.

Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp., moved its district sales office to 1128 Dublin, New Orleans 18, La. The firm's vice president in charge of sales is H. C. Allington.

Mettler Co. Inc. (division of Eclipse Fuel Engineering Co.) moved its administrative and manufacturing facilities from Los Angeles to Rockford, Ill. Mettler makes packaged, fan type, power, and process burners.

Falco Products Inc., Philadelphia, maker of aluminum ladders, tables, and laundry equipment, moved to larger quarters at 11th and York Streets, Philadelphia.

National Flexible Packaging Association moved to 11750 Shaker Blvd., Cleveland 20, Ohio.



New Baldwin hydraulic press

Combines high tonnage capacity with multiple motions normally found in small presses

Pictured above is a new 500-ton-capacity Hamilton hydraulic compacting press now in operation at the Burgess-Norton Mfg. Co., Geneva, Ill. Designed for compacting powdered metals, the new press embodies these features proven desirable in Baldwin's line of smaller presses:

Floating die • Automatic cycling • Die float control
Shuttle feeder • Accurate load downstops

These motions are made possible even in high tonnages at relatively low cost. The press features convenient control of the forces being exerted—and accurate control of the finished size of the part being formed.

This Hamilton compacting press is also made in 300, 750 and 1000-ton capacities. Write today for complete details, including specifications.

Please address inquiries to Dept. I-K

Hamilton Division Hamilton, Ohio

BALDWIN · LIMA · HAMILTON

Diesel engines • Mechanical and hydraulic presses • Can making machinery • Machine tools

BALDWIN BLH LIMA-HAMILTON

excellent visibility offers close working control

The transparency of Dortan cutting oils permits the machine operator to flood work and tool areas with a broad stream *without impairing visibility*. Clean working conditions permit easier gauging and measuring . . . assure finer finishes, increased output, fewer rejects.

Sulfur and other additives impart excellent machining properties to Dortan cutting oils. Smoking is minimized . . . low pour points make handling easy. Separation and settling are never problems. *Four* grades offer varying cutting strengths:

Dortan 41: General-purpose cutting oil – for most operations with fairly easily machined ferrous alloys.

Dortan 43: Moderate- to heavy-duty cutting oil for medium- to low-machinability steel or titanium.

Dortan 45: Highly compounded cutting oil with sulfur – will not stain copper or copper bearing alloys.

Dortan 50: Extremely heavy-duty active-sulfur-type oil – for steels of difficult machinability (as stainless and heat-resistant) and for internal broaching. Also excellent as form and thread grinding oil for soft, tough or stringy alloys.

Get complete technical data from the nearest Esso Standard Oil Company Division Office: Boston; Pelham, N.Y.; Elizabeth, N. J.; Bala-Cynwyd, Pa.; Baltimore; Richmond; Charlotte; Memphis; New Orleans.

DORTAN®

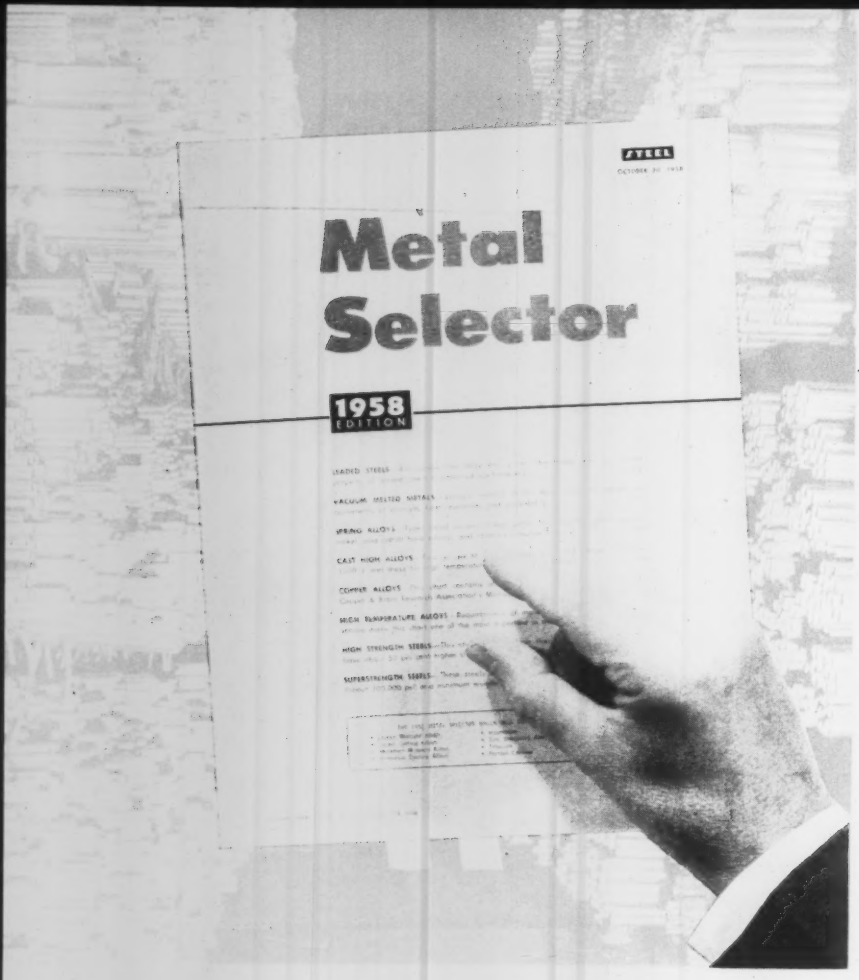
Esso

ESSO RESEARCH works wonders with oil

THE METAL SHOW SECTION

The 40th National Metal Exposition

Special Alloys Boost Metalworking's Future 158
The Metal Selector 165
Width Meters Trim Strip Waste 182
Vacuum Casting Tames Supermetals 191
Foundry Saves $29,448 a Year 198
Program 201



Special Alloys Boost Metalworking's Future . . .

REQUIREMENTS for metals are getting stiffer. The booming aircraft and missile industry, and increased emphasis on nuclear power are keeping metallurgists working around the clock to develop materials that will withstand the high temperatures, stresses, and corrosive environments those applications demand.

In more commonplace industries like electric power generation, petroleum, and chemical processing, new production techniques and a need for long-lived equipment are demanding more metals tailored to meet specific conditions.

All manufacturers are reaching out for improved metals to lift product quality and lower production costs.

Tool for Metalworking—The 1958 edition of STEEL's Metal Selector lists eight categories of metals and alloys that have been developed to handle the requirements of tomorrow's technology. Many of these "special" metals are expensive, when compared with ordinary steel, but the job they can do makes them indispensable.

Leaded Steels—The free machining properties of the leaded steels can lower your cutting costs, boost tool life, and improve product quality. All AISI carbon and alloy grades are listed along with the proprietary compositions of producers.

Vacuum Melted Metals—Tailored to meet the requirements of strength, heat resistance, and workability, these alloys have made our aircraft and missile program possible. Their outstanding characteristics are proving valuable in commercial applications.

Spring Alloys—Like other engineering applications, spring uses today require extensive evaluation. Materials developed for other uses are becoming valuable spring alloys. The Selector lists carbon, alloy, and stainless spring materials; copper, nickel, and cobalt-base materials, and constant modulus alloys.

Cast High Alloys—Here's another material that is getting wide play because of its properties. Two groups are listed: Casting alloys for corrosive service below 1200° F. and casting alloys for corrosion and heat resistance above 1200° F.

Copper Alloys—This chart contains all the wrought materials not listed in the Copper & Brass Research Association's *Manual of Standard Alloys*.

High Temperature Alloys—Broken down into five groups, the metals in this chart are both air melted and vacuum melted. Developed specifically to retain strength at high temperatures, these alloys are among the most important listed.

High Strength Steels—These medium and low alloy structural steels exhibit a 50 per cent higher yield strength than equivalent carbon steels. They increase load carrying capacity of structures while keeping weight down.

Superstrength Steels—These are a small group of steels that are used where maximum usable strength (about 300,000 psi) and minimum weight are of primary importance.

This year's Selector supplements the 1957 edition which contained

more "standard" alloys. A listing of the metals contained in that edition is on the first page of the 1958 Selector. Last year's listing will be revised in 1959.

Leaded Steels

The benefits you can get from leaded steels depend on the nature of the part and your equipment.

Super Machining Grades—Major demand in leaded steel production is directed toward the super machining steels with 0.24 to 0.35 per cent sulfur. But there are growing requests for lead additions to the lower sulfur screw stocks (0.08 to 0.13 sulfur).

The addition of lead to such grades as C1117 and C1118 results in about a 25 per cent increase in machining rate. The improved cutting quality can be used to advantage on older screw machines and brings about increased production without adding new equipment.

A similar condition exists in the nonresulfurized carbon steels such as C1016, C1018, C1030, and C1040. In the higher carbon grades, such as C1050, lead can be used to upgrade cutting quality and may save an annealing operation. A parallel situation exists in the alloy field.

Shops with older equipment which cannot take full advantage of the superfast machining leaded grades (because maintenance of machines becomes too serious a problem) should investigate the slower cutting grades. They promise increased machining potential.

What Lead Does — The leaded grades of steel contain 0.15 to 0.35 per cent lead, so finely dispersed that it cannot be seen when magnified 500 times. It gives the steels their free machining characteristics but does not affect their mechanical properties.

Lead lowers the steel's friction component by lubricating the cutting edge of the tool where it contacts the work and where the chip bears against the tool face. Because of the fine dispersion of lead particles, chips break up into shorter lengths than usual, quickly fall clear of the tool.

Leaded steels give a smooth finish because they cut cleanly. On some parts, this characteristic makes it easier to maintain tolerances. A finish machining or grinding operation may be eliminated.

The lighter colored chips were machined from a leaded steel. The darker chips were cut from the same grade of steel without a lead addition

Lead in Forgings—Although most leaded steel is produced as screw machine stock, significant applications are growing for leaded steel forgings, both in shafts and circular shapes.

One producer reports that lead-additive steel has reduced machining time as much as 71 per cent, and increased tool life up to ten times.

A recent approval for the use of leaded steel circular forgings has come from the Army Ordnance Corps for the production of combat tank turret rings. The approval was gained after tests conducted by the military arm established that the leaded forgings retain all the physical characteristics of regular steel in any AISI grade.

Gear Cutting Easier—One gear fabricator, cutting a double-web gear in 10L45 steel, reduced his tooling cost from $180 to $20 a gear. In another case, using the same grade forging, a manufacturer cutting rings obtained ten pieces per tool regrind, compared with three pieces with regular steel forgings.

Another gear manufacturer reduced his machine time 47.4 per cent and cutter wear by 20 per cent. The improved surface finish eliminated a heavy burr which had required extensive hand filing.

Leaded Stainless—Although most demand for lead additions is in carbon and alloy steels, producers will add lead to nearly any steel you are using.

One company regularly produces a leaded austenitic stainless grade. Similar to Type 303, the leaded version contains 0.3 per cent free machining addition which is divided between lead and sulfur. The producer cites cases where 303 Pb has increased spindle speeds up to 43 per cent and improved tool life 200 per cent.

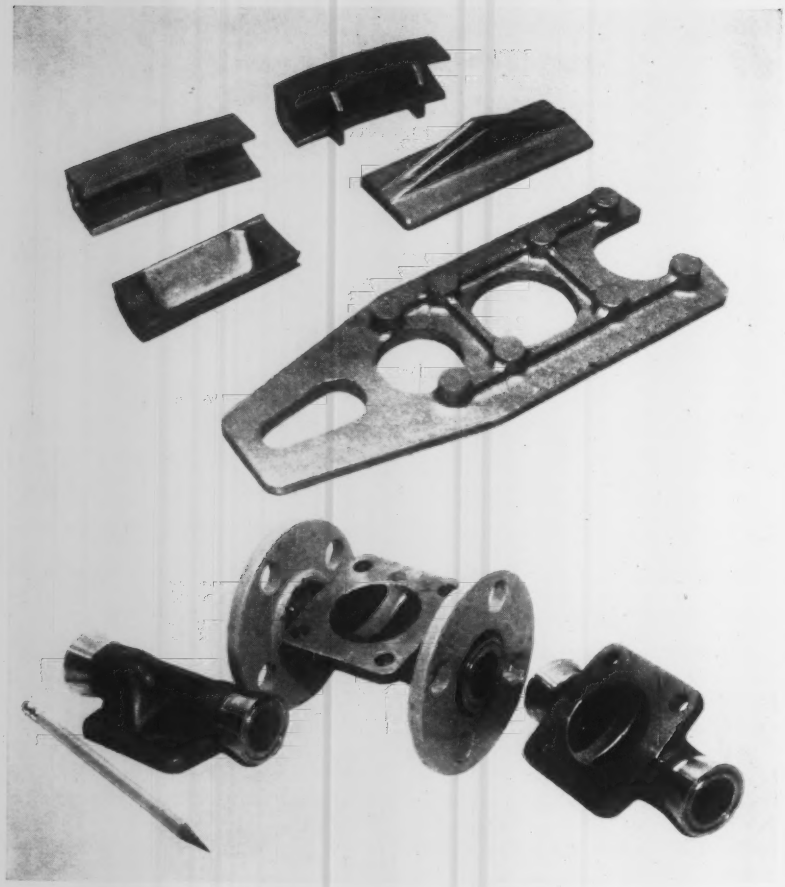
Vacuum Melted Metals

This is one of the fastest growing special metals. Larger quantities and sizes in a greater variety of grades are becoming available.

Since STEEL's selector listing vacuum melted metals was first published in 1956, the number of alloys has more than doubled.

Only a few are new, but metal producers are finding they can upgrade many of the materials they have been producing by vacuum melting them.

Advantages—In vacuum melting, close composition control is possible. Materials can be melted without substantial loss of critical alloying elements through oxidation or other undesirable reactions



Oregon Metallurgical Corp., Albany, Oreg., vacuum melts and casts a variety of special alloys. Here are typical parts. At the top are titanium castings for a ramjet engine; below them are titanium and zirconium valve bodies

that often occur in air melting. Vacuum melted metals are essentially free of inclusions, impurities, gases, and oxides.

Of immediate military importance, vacuum melted alloys are largely responsible for the operational development of jet engines. Without the high strength, high temperature characteristics of these alloys, extreme altitudes and sonic speeds would have been impossible.

Civilian Potential—Although the bulk of vacuum melted metals goes into military applications, the basic characteristics of the materials indicate an expanding future in other fields. Civilian industries can obtain production lots or test quantities of materials that have great strength at temperatures of 1300 to 1800° F.

Vacuum melted, high temperature nickel and cobalt-base alloys are much stronger and more ductile than their air melted compositions. They are superior in stress rupture, tensile, and fatigue strengths because of the more effective use of alloying elements such as titanium, aluminum, and zirconium.

Improved ductility is the result of greater over-all cleanliness of the metal and its reduced gas content. Finished products with better properties and performance can be obtained with less manufacturing effort and scrap losses.

Steels Improved—Vacuum melted structural steels have higher fatigue strength than those produced by the best air melting processes. They exhibit uniform properties in all directions. They are ideally suited for highly loaded gears, shafts, wheels, and other structural parts.

Users of tool and die steels are requesting vacuum melted products to obtain a higher polish and finer surface finish.

When high strength alloy steels are hardened to 280,000-300,000 psi tensile strength, the strength-to-weight ratio becomes desirable for aircraft uses. The objectionable characteristic at this strength level is the lack of transverse ductility. Vacuum melting gives the steels that property.

Bearings Upgraded—The life of bearings made from vacuum melted materials is as much as 400 per cent better because the metals have no impurities. Although the best air melted bearings often compare favorably with the best vacuum melted bearings, the vacuum melted product provides consistently better reliability. Rejects and early failures from material defects are eliminated.

Springs and diaphragms produced from vacuum melted metals outperform those made from air melted metals. The superior fatigue properties result in longer life and consistently reliable performance at high temperatures and stresses.

In electronic applications, manufacturers are using the materials in vacuum tubes where high vapor pressures which often result from air melted metals play havoc with their operations.

Makes Alloys Possible — Special improved alloys using elements that are reactive in air can be produced by vacuum melting. Iron-chrome-aluminum alloys, with aluminum content higher than possible with air melting, are being produced. Instead of reacting with the air to form oxide impurities, the aluminum improves the alloy's corrosion resistance and machinability.

In the development of nuclear reactor materials, metals with high boron content were needed for shielding and control purposes.

Type 304 stainless with 1 per cent boron is workable, but boron over that level causes poor workability. Vacuum melted Type 304 with up to 2 per cent boron is malleable.

Improves Workability—One of the most important advantages of

vacuum melting lies in its improved workability. Superalloys such as A-286, M-308, Waspaloy, and Rene 41 are difficult to form when air melted because of a variety of nonmetallic particles that exist through chemical reactions with air.

Spring Alloys

The use of spring materials, like other engineering applications, has become highly specialized.

Carbon steel is the traditional work horse and is still useful in many products. But today the design engineer often has to deal with elevated temperatures and corrosive media. STEEL's spring alloy section of the Metal Selector will give him a better knowledge of the special alloy spring materials available.

Temperature Groups—Based on temperature, applications may be roughly grouped into three categories: Up to 300° F; 300 to 600° F; above 600, not exceeding 1200° F. At 1200° F and above, the mechanical properties of all commercially available spring materials diminish rapidly.

Another limiting factor is the stress the materials will be subject to at high temperatures. Those which offer satisfactory performance at high temperatures must be designed for working stresses within a tolerable level. Like temperature, high working stresses increase the rate of relaxation of spring metals.

High Temperature Alloys — Six alloys compete for service at 600° F and above: A-286, S-816, Haynes Alloy 25, 17-7 PH, Elgiloy, and Inconel "X" (AMS 5698, No. 1 Temper Wire).

Not all offer suitable resistance to relaxation up to 1200° F. Some have unknown relaxation characteristics.

Molybdenum has been adopted by several companies for high temperature springs. It is similar in torque characteristics and conductivity to beryllium copper. But its high cost and difficulty in processing to required sizes has limited it to special applications.

Some of the alloys developed for other applications are finding greater use in the spring field. The precipitation hardening stainless steels are an example. This is particularly true in the case of high temperature alloys for jet engine use.

The demand for high temperature springs is small but insistent, and many of the superalloys are finding use as spring elements.

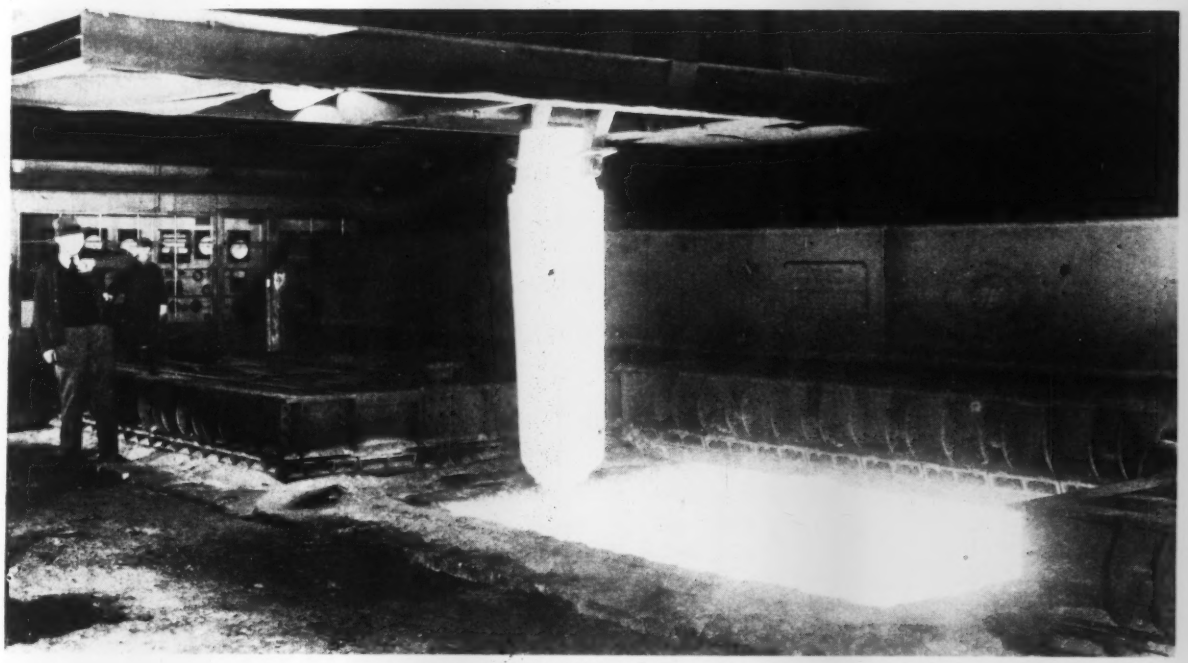
Structural Elements—A new field in the experimental stage is the use of thin high tensile carbon or stainless steel strip as structural elements in rocket cases and airframe sections. With tensile strengths around 300,000 psi, the materials in a properly designed structure can have a favorable strength-weight ratio.

There have been few major changes in the basic spring materials, but steady gains are being made in increasing the dependability, performance, and ease of handling of the products.

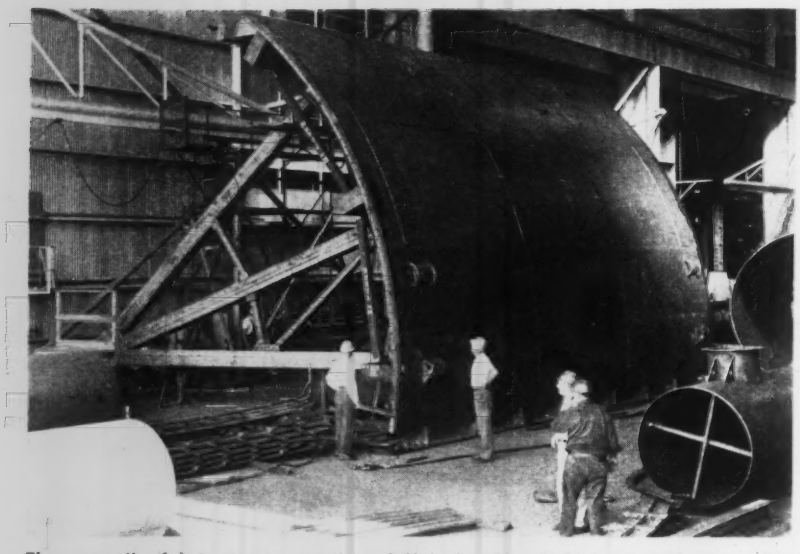
Improvements — Phosphate coating of music wire before wet drawing results in consistently higher tensile strength. Enough residual phosphate is retained to assist in spring coiling operations. One company is offering an oil tempered wire with an improved oxide coating.

In copper-base spring alloys, there are two developments. A Connecticut brass mill has developed a superfine-grain phosphor bronze spring wire that gave satisfactory performance after 2 million deflections at stresses ranging from 36,600 to 73,200 psi.

Another brass mill has announced phosphor bronze strip in the spring temper with 200 per



High alloy castings are being used to modernize soaking pits in a steel mill



The versatile fabricating properties of Kaisaloy No. 1 high strength, low alloy steel are illustrated in this spillway gate for a large northwest dam

cent more ductility. Available in three grades, the metal offers better formability and part uniformity and less tool wear. It retains all the strength and hardness of regular spring temper bronze.

Cast High Alloys

The mushrooming atomic energy and missile industries have given impetus to greater use of cast high alloys.

In Atomics—Many of the important pumps, valves, and fittings being installed in Detroit Edison's Enrico Fermi nuclear powerplant are of Type CF-4 (extra low carbon 18-8) alloy.

The Shippingport (Pa.) Atomic Power Station uses an 8000-lb pump casing and 18-in. valve bodies of Type CF-8 alloy in each of its four primary coolant loops.

In the Yankee Atomic Electric Co. and Consolidated Edison nuclear powerplants now under construction, 15,000-lb pump casings have been designed to be cast of Type CF-8 alloy.

In Missiles—Corrosion resistant castings are handling the highly corrosive fuels that power missiles and rockets. Cast heat resistant components are used in launching devices.

Centrifugally cast valve bodies, weighing 180 lb each, are used in the Atlas ICBM. Redesigned from a welded construction at a cost saving of about 30 per cent, the valves withstand severe thermal and mechanical shock from − 65 to nearly + 500° F.

STEEL's **Listing**—The Metal Selector lists standard designations developed by the Alloy Casting Institute for compositions in the two major divisions of cast high alloys.

The corrosion resistant group is designated by a "C" and covers alloys used for corrosive conditions at less than 1200° F. The heat resistant group is designated by an "H" and covers alloys used where temperatures exceed 1200° F.

Wide Applications—A glance at the cast high alloy table will show you the wide range of applications the 28 alloys cover.

Many alloys of about the same composition are used for corrosion resistance and high temperature service. But the "H" grades usually contain more carbon than the "C" types.

Production Techniques—The Alloy Casting Institute reports greater use of CO_2 molding, especially in coremaking. It's being used extensively with shell molding in high volume production. Shell molding is growing in the industry, particularly for volume production of valves, pumps, and fittings.

Exothermic materials are finding wider use in high alloy casting production. Increasing demand for larger castings is taxing melting capacity. The use of exothermic sleeves on risers permits more efficient use of molten metal in the manufacture of some casting types.

Copper Alloys

Intensive research and development of copper-base alloys have resulted in new types and improved old ones. In two years, STEEL's table of wrought alloys not listed in the Copper & Brass Research Association's *Manual of Standard Alloys* has grown from 46 to 80.

Developments — The fine-grain drawing brass produced by an eastern mill eliminated a finishing room bottleneck for a manufacturer of brass lighting fixtures and cut his costs drastically.

Another brass mill has developed a corrosion-resistant, nickel-silicon bronze alloy which has high yield and tensile strengths at elevated temperatures. Containing 1.9 per cent nickel and 0.6 per cent silicon, it is age hardenable and available in soft, cold forming, and hard tempers.

Tests on ½ in., cold headed, roll threaded bolts made from the alloy showed a nominal proof load of 8000 lb, vs. 5000 lb for a standard Type B Silicon Bronze. The alloy is free from silicon segregation and is not subject to fire-cracking during processing.

A new aluminum bronze alloy developed by a midwestern brass company eliminates the need to stress relieve finished parts. It also permits alterations or repairs in the field without heat treatment. The alloy can be used in industries where nickel-bearing and stainless steel alloys have dominated.

Al-Si Bronze—Aluminum added to brass increases its strength and improves its resistance to impingement corrosion. A small amount of silicon lowers its thermal and electrical conductivity, and makes it particularly suitable for welding. Silicon added to aluminum bronze increases its strength, corrosion resistance, and machinability.

Ni-P Bronze—The nickel phos-

phorous bronzes have several outstanding characteristics: Good machinability, hot and cold workability, conductivity, high strength, age hardenability, high fatigue strength, and good corrosion resistance.

Te Copper—The tellurium copper special alloys are relatively free machining. They are used for parts that require high conductivity and fine machine work.

STEEL's Metal Selector offers you 80 copper alloys with varying proportions of zinc, tin, silicon, aluminum, tellurium, phosphorus, cadmium, chromium, nickel, lead, manganese, and iron to meet specific metal requirements.

General Properties—All the alloys have good corrosion resistance, strength, thermal and electrical conductivity. They resist fatigue, abrasion, and wear. Many are supplied in a spring temper. All can be brazed, soldered, and welded. They have good cold and hot working properties and excellent machinability.

Once the fabricator determines which properties fit the needs of his product and methods of manufacture, the brass mill can furnish uniform processed material that will help him reduce unnecessary labor and spoilage.

High Temperature Alloys

The requirements of materials for aircraft and missile service make STEEL's chart of high temperature alloys one of the most valuable in the Metal Selector.

Uses Growing—New applications for these materials continue to appear in gas turbine engines and missile components. Nuclear energy equipment demands the properties of the high temperature alloys. In other areas, like electric power generation, petroleum, and chemical process industries, the need for the materials is gaining.

In aircraft turbine engines, metal temperatures are approaching the 1700 to 1800° F range. New cobalt-base and nickel-base alloys are appearing. The nickel-base alloys, both wrought and cast, usually are vacuum melted.

Properties Improving—Some of the more recent investment-casting alloys are first vacuum melted, then vacuum cast. Several alloys of this type have 100-hour stress-rupture strengths above 18,000 psi at 1800° F.

Redesigning this diesel crane, which included the replacement of carbon steel beams, plates, and sheets with Mayari R high strength, low alloy steel, enabled Industrial Brownhoist Corp., Bay City, Mich., to raise its lifting capacity from 200 to 250 tons without any appreciable increase in dead weight

Higher turbine temperatures have affected other areas of the engine. In the hot sections of tail pipe liners and afterburners, much use is being made of wrought cobalt-base alloys and nickel-base precipitation hardening materials. Alloys which were used for these parts are now used in the relatively cooler areas.

Commercial Applications—Short-cycle, high temperature, and continuous heat treating operations have increased the demand for more durable alloys. Materials which once were considered too costly for industrial use are now being used commercially because of their greater life under severe operating conditions.

Generally, these alloys contain large amounts of nickel and chromium with other elements. Some of these alloys which were used exclusively in aircraft turbines are now being used for industrial heat treating applications because of their excellent oxidation resistance and high strength.

In steam generating stations, maximum steam temperatures are going up. They have increased from 1000 to 1200° F along with a rise in pressures.

Temperatures Rising—Fabricated sheet metal parts are being called on to bear greater loads in applications which formerly used forged or cast parts. Today's jet engines use sheet metal parts where temperatures may reach 2100° F.

Elevated temperatures are involved in structural parts of supersonic aircraft and missiles.

Die Steels Expand—A group of hot work die steels has been used for tools requiring a high degree of toughness and strength at elevated temperatures. A number of them have a wide hardening range. Many of them have potentialities for aircraft structural parts subject to aerodynamic heating. Alloys typical of this group keep their strength in the 200,000 psi range up to 1000° F.

Some of the alloys listed in STEEL's Metal Selector are in the middle temperature zone (500 to 1000° F). Their principal advantage is their low coefficient of thermal expansion, similar to that of titanium and ferritic stainless steel. This means stresses caused by thermal expansion are minimized.

High Strength Steels

High yield strengths characterize this family of relatively inexpensive structural steels. They will handle unit loads one-fourth to one-third

higher than their carbon steel equivalents.

Easily Formed—They can be roll formed, bent in press brakes, and drawn in presses, although their high yield strengths impose some limitations on cold work. While higher unit stresses are required for cold working, the total forming forces required often are no greater than those used for ordinary structural steel. The higher yield strengths allow designers to work with lighter sections of the material.

The low alloy additions to this family of steels increase corrosion and abrasion resistance, and improve impact and fatigue properties.

Although they cost more than carbon grades, these steels pay for themselves through minimum cost per unit of strength and low maintenance expense.

Applications—High strength, low alloy steels are being used in bridges, where their strength-to-weight ratio makes it possible to design structures with stronger members while reducing the overall weight.

They are being formed into structural parts of trucks and trailers where their lightness helps increase payload without loss of body strength.

Their resistance to abrasion suits them for use in rotating drums of cement-mix trucks, ore-carrying barges and trucks, and earthmoving equipment.

Resist Corrosion—The Pennsylvania Railroad's extra long piggyback flat cars haul two fully loaded highway trailers. High strength steel is used to reduce dead weight and stand the heavy concentration of loads encountered in the long spans between truck center plates.

Manufacturers of agricultural equipment are using the steels in combines, hay balers, corn pickers, fertilizer wagons, water tanks, and tractor parts. They permit lighter, stronger construction. Improved corrosion resistance shows up when parts are left out in the weather.

Formable Grades—Although applications usually involve a situation where there is a penalty for dead weight, uses are found in a diversity of products. The material has qualified in auto and truck bumper face bars, wheel, auto brake parts, LP gas cylinders, and other containers. Formable grades are being shaped into carrier frame members for guided missiles.

The low carbon content of the high strength steel grades makes them easily weldable by manual or automatic methods. The favorable chemical composition limits hardness increase in the weld zone and allows welds to retain adequate ductility upon cooling. Preheating is no more necessary than for regular structural steel welded under the same conditions.

Superstrength Steels

This small group of low alloy, hardenable steels is used where ultrahigh strength is needed. Strength levels to 300,000 psi (and higher, experimentally) are obtained in the quenched and tempered condition, which makes these steels the strongest materials available in terms of their weight.

Compared with a 75ST aluminum extrusion (80,000 psi), steel with a tensile strength of 220,000 psi has about the same strength-to-weight ratio. This makes the superstrength steels lighter than aluminum when load carrying ability is the criterion.

These steels were originally used in aircraft landing gears and airframe components where their high strength and elastic modulus gave them an advantage over aluminum alloys.

Uses Growing — While aircraft applications still take the bulk of these steels, more of them are finding their way into machine and automotive parts, shafting, gears, and other applications where their ultrahigh strength is needed. More of them are being processed into relatively light gage, flat rolled products for missiles.

The greatest demand for superstrength steels is in the 260,000 to 280,000 psi tensile range. There has been a recent tendency to emphasize transverse tensile properties and to base specific requirements largely on the transverse ductility as measured by reduction of area.

Improvements Coming—As uses for the steels have increased, more information has been gathered with respect to melting, testing, and acceptance of the materials. As a consequence, the specification requirements are being adjusted to the properties that can be developed in well-made heats of steel of the various popular compositions.

One producer states that it doesn't seem practical to consider the use of the materials at strength levels above 300,000 psi. Above this level, ductility is low and erratic. Part of the difficulty arises from the nature of the tensile test as a measure of strength. He suggests other means, such as the bending test, that will give a satisfactory ultimate fiber strength of the extra-hard steels.

One of the newest superstrength steels is U. S. Steel's X-200, which develops minimum tensile strength of 280,000 psi. Sections (sheet and strip) of the material under 0.250 in. can be air cooled from the hardening temperature. Sections over 0.250 in. will develop the same strength level with oil quenching.

Shop Problems — The superstrength steels create shop problems which are a little out of the ordinary. Hardness values intensify certain hazards which go unnoticed at lower strength levels, including sensitivity to: 1. Hydrogen embrittlement in plating. 2. Damage in grinding. 3. Effects of decarburization.

Careful handling and regular inspection are needed all along the production line. Also, design should minimize notch effects and stress raisers.

EXTRA COPIES ARE AVAILABLE

Don't remove the Selector. Get your free copy by writing: Editorial Service, STEEL, Penton Bldg., Cleveland 13, Ohio. Ask for the "Metal Selector, 1958 Edition." If you want copies in quantity, the price is 10 cents each.

STEEL
OCTOBER 20, 1958

Metal Selector

1958 EDITION

LEADED STEELS—All carbon and alloy bar grades are listed. The outstanding property of leaded steels is improved machinability S-2

VACUUM MELTED METALS—Vacuum melting tailors these alloys to specific requirements of strength, heat resistance, and workability S-4

SPRING ALLOYS—Types listed include carbon, alloy, and stainless steels; copper, nickel, and cobalt base alloys; and constant modulus alloys S-7

CAST HIGH ALLOYS—Two groups of casting alloys are listed: Those for below 1200° F and those for high temperature service above 1200° F S-9

COPPER ALLOYS—This chart contains all the wrought alloys not listed in the Copper & Brass Research Association's Manual of Standard Alloys S-10

HIGH TEMPERATURE ALLOYS—Requirements of materials for aircraft and missile service make this chart one of the most important in the Selector S-12

HIGH STRENGTH STEELS—This chart includes high strength, low alloy steels that have about 50 per cent higher strength than structural carbon steels S-15

SUPERSTRENGTH STEELS—These steels are used where maximum usable strength (about 300,000 psi) and minimum weight are of primary importance S-16

THE 1957 METAL SELECTOR WHICH WILL BE REVISED IN 1959 COVERS:

- Copper Wrought Alloys
- Copper Casting Alloys
- Aluminum Wrought Alloys
- Aluminum Casting Alloys
- Magnesium
- Zinc Diecasting Alloys
- Titanium
- Ferrous Castings
- Stainless Steels
- Alloy Steels
- H-Steels

Copyright STEEL, Penton Building, Cleveland 13, Ohio

LEADED STEELS

Chemical composition ranges and limits*—Except as noted, all steels contain lead within range 0.15-0.35.

AISI Number or Trade Name	C	Mn	P	S	Si	Ni	Cr	Mo	Forms Available and Source—See Key: HR Bars	CF Bars	Billets
C1015	0.13–0.18	0.30–0.60	0.04	0.05					A7, C17, J5, R2	A7, C17, J5, R2, W8, W18	B2, C17
C1016	0.13–0.18	0.60–0.90	0.04	0.05					A7, B2, C17, J5, R2	A7, B5, C17, J5, R2, W8, W18	B2, C17
C1017	0.15–0.20	0.30–0.60	0.04	0.05					A7, B2, C17, J5, R2	A7, B5, C17, J5, R2, W8, W18	B2, C17
C1018	0.15–0.20	0.60–0.90	0.04 max	0.05 max					A7, B2, C17, I-2, J5, R2	A7, B5, C17, J5, M12, N5, P5, R2, W8, W18	B2, C17
C1020	0.18–0.23	0.30–0.60	0.04	0.05					A7, B2, C17, J5, R2	A7, C17, J5, R2, W8, W18	B2, C17
C1020	0.17–0.24	0.30–0.60	0.04	0.05					.....	.....	Plate I-2
New E-Z Cut	†0.24	1.25	0.02	0.055	0.07				.....	.....	Plate R12
C1022	0.18–0.23	0.70–1.00	0.04 max	0.05 max					A7, B2, C17, I-2, J5, R2	A7, B5, C17, J5, R2, W8, W18	B2, C17
C1024	0.19–0.25	1.35–1.65	0.04	0.05					A7, B2, C17, J5, R2	A7, C17, J5, R2, W8, W18	B2, C17
C1025	0.22–0.28	0.30–0.60	0.04	0.05					A7, B2, C17, J5, R2	A7, C17, J5, R2, W8, W18	B2, C17
C1026	0.22–0.28	0.60–0.90	0.04	0.05					A7, B2, C17, I-2, J5, R2	A7, B5, C17, J5, R2, W8, W18	B2, C17
C1035	0.32–0.38	0.60–0.90	0.04	0.05					A7, B2, C17, J5, R2	A7, C17, J5, R2, W8, W18	B2, C17
C1036	0.30–0.37	1.20–1.50	0.04	0.05					A7, B2, C17, J5, R2	A7, C17, J5, R2, W8, W18	B2, C17
C1037	0.32–0.38	0.70–1.00	0.04	0.05					A7, B2, C17, J5, R2	A7, C17, J5, R2, W8, W18	B2, C17
C1040	0.37–0.44	0.60–0.90	0.04	0.05					A7, B2, C17, J5, R2	A7, C17, J5, R2, W8, W18	B2, C17
C1041	0.36–0.44	1.35–1.65	0.04	0.05					A7, B2, C17, J5, R2	A7, C17, J5, R2, W8, W18	B2, C17
C1045	0.43–0.50	0.60–0.90	0.04	0.05					A7, B2, C17, J5, R2	A7, B5, C17, J5, M12, P5, R2, W8, W18	B2, C17
C1050	0.48–0.55	0.60–0.90	0.04	0.05					A7, B2, C17, J5, R2	A7, C17, J5, R2, W8, W18	B2, C17
C1052	0.47–0.55	1.20–1.50	0.04	0.05					A7, B2, C17, J5, R2	A7, C17, J5, R2, W18	B2, C17
C1095	0.90–1.03	0.30–0.50	0.04	0.05					A7, B2, C17, J5, R2	A7, C17, J5, R2, W18	B2, C17
B1113 J&L 1113 Bess	0.09 max	0.70–1.00	0.07–0.12	0.24–0.33					.....	J5, P5, W18	.....
C1115	0.13–0.18	0.60–0.90	0.04	0.08–0.13					B2, C17, R2	C17, R2, W18	B2, C17
C1117 Jalcase 4	0.14–0.20	1.00–1.30	0.04 max	0.08–0.13					B2, C17, I-2, J5, R2, W8	B5, C17, J5, M12, P5, R2, R12, W8, W18	B2, C17
Leaded Rycase	†0.17	1.25	0.025	0.10	0.08				.....	R12	.....
Leaded Rytense	0.41	1.55	0.022	0.127					.....	R12	.....
C1118 Jalcase 5	0.14–0.20	1.30–1.60	0.04	0.08–0.13					B2, C17, I-2, J5, R2	C17, J5, R2, W8, W18	B2, C17
C1119	0.14–0.20	1.00–1.30	0.04	0.24–0.33					B2, C17, R2	C17, R2, W8, W18	B2, C17
C1120	0.18–0.23	0.70–1.00	0.04	0.08–0.13					B2, C17, R2	C17, R2, W8, W18	B2, C17
C1137 Jalcase 7	0.32–0.39	1.35–1.65	0.04	0.08–0.13					A7, B2, C17, I-2, J5, R2	A7, C17, J5, M12, P5, R2, S17, W8, W18	B2, C17
C1141 Jalcase 8	0.37–0.45	1.35–1.65	0.04	0.08–0.13					A7, B2, C17, I-2, J5, R2	A7, B5, C17, J5, M12, R2, W8, W18	B2, C17
C1144 Jalcase 9	0.40–0.48	1.35–1.65	0.04	0.24–0.33					A7, B2, C17, I-2, J5, R2	A7, B5, C17, J5, R2, W8, W18	B2, C17
C1146	0.42–0.49	0.70–1.00	0.04	0.08–0.13					A7, B2, C17, R2	A7, C17, R2, W8, W18	B2, C17
C1151	0.48–0.55	0.70–1.00	0.04 max	0.08–0.13					A7, J5, R2	A7, J5, R2, W18	.....
C1153	0.49–0.55	1.30–1.65	0.04	0.23–0.33					A7, C17, R2	A7, C17, R2, W18	C17
C1160	0.55–0.65	1.30–1.65	0.04	0.24–0.33					C17, R2	C17, R2, W18	C17
C1213	0.13 max	0.70–1.00	0.07–0.12	0.24–0.33					A7, B2	A7, B5, W18	.....
IS1213	0.09 max	0.70–1.00	0.07–0.12	0.24–0.33					I-2	.....	.....
Beth Led	0.09 max	0.70–1.00	0.07–0.12	0.24–0.33					B2	.....	.....
RS-C1213	0.09 max	0.70–1.00	0.04–0.09	0.24–0.33					R2	R2	.....
J&L 1213 OH	0.09 max	0.70–1.00	0.07–0.12	0.24–0.33					J5	J5, N5	.....
C12L14 SAE 12L14	0.15 max	0.80–1.20	0.04–0.09	0.25–0.35					A7, B2, C17, I-2, J5, R2	A7, B5, C17, J5, P5, R2, W8, W18	.....
Ledloy A RS Grade A	0.15 max	0.80–1.20	0.04–0.09	0.25–0.35	0.10 max				C17, I-2, R2	B5, C17, M12, N5, P5, R2, R12, S17, W8, W18	C17
Amer-Led A	0.15 max	0.80–1.20	0.04–0.09	0.25–0.35					A7	A7, N5	.....
J&L Type A-OH	0.15 max	0.80–1.20	0.04–0.09	0.25–0.35					.....	J5	.....
J&L Type B-OH	0.15 max	0.85–1.35	0.04–0.09	0.40 min					J5	J5	.....

AISI Number or Trade Name	C	Mn	P	S	Si	Ni	Cr	Mo	Forms Available and Source—See Key: HR Bars	CF Bars	Billets
Yolead OH-A	0.13 max	0.80–1.20	0.04–0.09	0.25–0.33	.....	.....	.....	.....	Y1	Y1	.....
Yolead Bess	0.13 max	0.70–1.10	0.07–0.12	0.20–0.33	.....	.....	.....	.....	Y1	Y1	.....
J&L Super B Bess	0.15 max	0.85–1.35	0.04–0.09	0.40 min	.....	.....	.....	.....	J5	J5	.....
La-Led	0.13 max	0.80–1.20	0.04–0.09	0.25–0.35	.....	.....	.....	.....	.....	L2	.....
Super La-Led	0.13 max	0.80–1.20	0.04–0.09	0.40–0.50	.....	.....	.....	.....	.....	L2	.....
Ledloy B	0.15 max	0.85–1.35	0.04–0.09	0.40 min	0.10 max	.....	.....	.....	I-2	B5, M12, P5, R12, W8	.....
Amer-Led B	0.15 max	0.85–1.35	0.04–0.09	0.36 min	.....	.....	.....	.....	A7, B2	A7	.....
1335	0.33–0.38	1.60–1.90	0.04	0.04	0.20–0.35	.....	.....	.....	A7, B2, C17, R2	A7, C17, R2, W8, W18	B2, C17
4028	0.25–0.30	0.70–0.90	0.04	0.035–0.050	0.20–0.35	.....	.....	0.20–0.30	A7, B2, C17, R2	A7, B2, C17, R2, W8, W18	B2, C17
4032**	0.30–0.35	0.70–0.90	0.04	0.04	0.20–0.35	.....	.....	0.20–0.30	B2, B5, C17, R2	B2, B5, C17, R2, W8	B2, C17
4037	0.35–0.40	0.70–0.90	0.04	0.04	0.20–0.35	.....	.....	0.20–0.30	A7, B2, C17, R2	A7, B2, B5, C17, R2, W8, W18	B2, C17
4047	0.45–0.50	0.70–0.90	0.04	0.04	0.20–0.35	.....	.....	0.20–0.30	A7, B2, C17, R2	A7, B2, C17, R2, W8, W18	B2, C17
4118	0.18–0.23	0.70–0.90	0.04	0.04	0.20–0.35	.....	0.40–0.60	0.08–0.15	A7, B2, C17, R2	A7, B2, C17, R2, W8, W18	B2, C17
4130	0.28–0.33	0.40–0.60	0.04	0.04	0.20–0.35	.....	0.80–1.10	0.15–0.25	A7, B2, C17, R2	A7, B2, C17, R2, W8, W18	B2, C17
TS4132**	0.30–0.35	0.45–0.65	0.04	0.04	0.20–0.35	.....	0.90–1.20	0.08–0.15	C17	C17	C17
4135	0.33–0.38	0.70–0.90	0.04	0.04	0.20–0.35	.....	0.80–1.10	0.15–0.25	A7, B2, C17, R2	A7, B2, C17, R2, W8, W18	B2, C17
4137	0.35–0.40	0.70–0.90	0.04	0.04	0.20–0.35	.....	0.80–1.10	0.15–0.25	A7, B2, C17, R2	A7, B2, B5, C17, R2, W8, W18	B2, C17
4140	0.38–0.43	0.75–1.00	0.04	0.04	0.20–0.35	.....	0.80–1.10	0.15–0.25	A7, B2, C17, I-2, P5, R2, R12	A7, B2, B5, C17, L2, M12, N5, R2, R12, S17, W8, W18	B2, C17
Rycut 40	†0.41	0.85	0.025	0.031	0.28	.....	0.92	0.19	R12	R12	.....
4142	0.40–0.45	0.75–1.00	0.04	0.04	0.20–0.35	.....	0.80–1.10	0.15–0.25	A7, B2, C17, R2	A7, B2, B5, C17, M12, R2, W8, W18	B2, C17
4145	0.43–0.48	0.75–1.00	0.04	0.04	0.20–0.35	.....	0.80–1.10	0.15–0.25	A7, B2, C17, R2	A7, B2, B5, C17, R2, W8, W18	B2, C17
4147	0.45–0.50	0.75–1.00	0.04	0.04	0.20–0.35	.....	0.80–1.10	0.15–0.25	A7, B2, C17, R2	A7, B2, B5, C17, R2, W8, W18	B2, C17
4150	0.48–0.53	0.75–1.00	0.04	0.04	0.20–0.35	.....	0.80–1.10	0.15–0.25	A7, B2, C17, R2	A7, B2, B5, C17, R2, W8, W18	B2, C17
TS4150	0.48–0.53	0.80–1.05	0.04 max	0.04 max	0.20–0.35	.....	0.90–1.20	0.08–0.15	A7, B2	A7, B2, W18	B2
New Rycut 50	†0.50	0.88	0.019	0.023	0.28	.....	0.96	0.21	R12	R12	.....
4320	0.17–0.22	0.45–0.65	0.04	0.04	0.20–0.35	1.65–2.00	0.40–0.60	0.20–0.30	A7, B2, C17, R2	A7, B2, C17, R2, W8, W18	B2, C17
4340	0.38–0.43	0.60–0.80	0.04	0.04	0.20–0.35	1.65–2.00	0.70–0.90	0.20–0.30	A7, B2, C17, R2	A7, B2, B5, C17, R2, W8, W18	B2, C17
4615	0.13–0.18	0.45–0.65	0.04	0.04	0.20–0.35	1.65–2.00	.....	0.20–0.30	A7, B2, C17, R2	A7, B2, C17, R2, W8, W18	B2, C17
4617	0.15–0.20	0.45–0.65	0.04	0.04	0.20–0.35	1.65–2.00	.....	0.20–0.30	A7, B2, C17, R2	A7, B2, C17, R2, W8, W18	B2, C17
4620	0.17–0.22	0.45–0.65	0.04	0.04	0.20–0.35	1.65–2.00	.....	0.20–0.30	A7, B2, C17, R2	A7, B2, C17, R2, W8, W18	B2, C17
4640**	0.38–0.43	0.60–0.80	0.04	0.04	0.20–0.35	1.65–2.00	.....	0.20–0.30	A7, B2, C17, R2	A7, B2, B5, C17, M12, R2, W8, W18	B2
4720	0.17–0.22	0.50–0.70	0.04	0.04	0.20–0.35	0.90–1.20	0.35–0.55	0.15–0.25	A7, B2, C17, R2	A7, B2, C17, R2, W8, W18	B2, C17
4812**	0.10–0.15	0.40–0.60	0.04	0.04	0.20–0.35	3.25–3.75	.....	0.20–0.30	B2, C17, R2	B2, C17, R2, W8, W18	B2, C17
4820	0.18–0.23	0.50–0.70	0.04	0.04	0.20–0.35	3.25–3.75	.....	0.20–0.30	A7, B2, C17, R2	A7, B2, C17, R2, W8, W18	B2, C17
4830**	0.27–0.34	0.40–0.65	0.04	0.04	0.20–0.35	3.25–3.75	.....	0.20–0.30	B2, C17, R2	B2, C17, R2, W8	B2, C17
5046	0.43–0.50	0.75–1.00	0.04	0.04	0.20–0.35	.....	0.20–0.35	.....	A7, B2, C17, R2	A7, B2, C17, R2, W8, W18	B2, C17
50B44	0.42–0.50	0.70–1.00	0.04	0.04	0.20–0.35	.....	0.35–0.60	(B 0.0005 min)	A7, B2, C17	A7, B2, C17, W8, W18	B2, C17
50B46	0.43–0.50	0.75–1.00	0.04	0.04	0.20–0.35	.....	0.20–0.35	(B 0.0005 min)	A7, C17	A7, B2, C17, W8, W18	B2, C17
5117**	0.15–0.20	0.70–0.90	0.04	0.04	0.20–0.35	.....	0.70–0.90	.....	C17, R2	B2, C17, R2, W8	B2, C17
5120	0.17–0.22	0.70–0.90	0.04	0.04	0.20–0.35	.....	0.70–0.90	.....	A7, B2, C17, R2	A7, B2, B5, C17, R2, W8, W18	B2, C17
5132	0.30–0.35	0.60–0.80	0.04	0.04	0.20–0.35	.....	0.75–1.00	.....	A7, B2, C17, R2	A7, B2, C17, R2, W8, W18	B2, C17
5135	0.33–0.38	0.60–0.80	0.04	0.04	0.20–0.35	.....	0.80–1.05	.....	A7, B2, C17, R2	A7, B2, C17, R2, W8, W18	B2, C17
5140	0.38–0.43	0.70–0.90	0.04	0.04	0.20–0.35	.....	0.70–0.90	.....	A7, B2, C17, R2	A7, B2, C17, R2, W8, W18	B2, C17
5150	0.48–0.53	0.70–0.90	0.04	0.04	0.20–0.35	.....	0.70–0.90	.....	A7, B2, C17, R2	A7, B2, C17, R2, W8, W18	B2, C17
5160	0.55–0.65	0.75–1.00	0.04	0.04	0.20–0.35	.....	0.70–0.90	.....	A7, B2, C17, R2	A7, B2, C17, R2, W8, W18	B2, C17
6120	0.17–0.22	0.70–0.90	0.04	0.04	0.20–0.35	.....	0.70–0.90	(V 0.10 min)	A7, B2, C17, R2	A7, B2, C17, R2, W18	B2, C17
6150	0.48–0.53	0.70–0.90	0.04	0.04	0.20–0.35	.....	0.80–1.10	(V 0.15 min)	A7, B2, C17, R2	A7, B2, C17, R2, W18	B2, C17

(Continued on page S-4)

LEADED STEELS (continued)

AISI Number or Trade Name	C	Mn	P	S	Si	Ni	Cr	Mo	Forms Available and Source—See Key: HR Bars	CF Bars	Billets
8615	0.13–0.18	0.70–0.90	0.04	0.04	0.20–0.35	0.40–0.70	0.40–0.60	0.15–0.25	A7, B2, C17, R2	A7, B2, B5, C17, R2, W8, W18	B2, C17
8617	0.15–0.20	0.70–0.90	0.04	0.04	0.20–0.35	0.40–0.70	0.40–0.60	0.15–0.25	A7, B2, C17, R2	A7, B2, B5, C17, R2, W8, W18	B2, C17
8620	0.18–0.23	0.70–0.90	0.04	0.04	0.20–0.35	0.40–0.70	0.40–0.60	0.15–0.25	A7, B2, C17, I-2, P5, R2, R12	A7, B2, B5, C17, I-2, L2, M12, R2, R12, W8, W18	B2, C17
Rycut 20	†0.21	0.80	0.023	0.029	0.31	0.63	0.52	0.22	R12	R12	.....
8622	0.20–0.25	0.70–0.90	0.04	0.04	0.20–0.35	0.40–0.70	0.40–0.60	0.15–0.25	A7, B2, C17, R2	A7, B2, C17, R2, W8, W18	B2, C17
8625	0.23–0.28	0.70–0.90	0.04	0.04	0.20–0.35	0.40–0.70	0.40–0.60	0.15–0.25	A7, B2, C17, R2	A7, B2, C17, R2, W8, W18	B2, C17
8630	0.28–0.33	0.70–0.90	0.04	0.04	0.20–0.35	0.40–0.70	0.40–0.60	0.15–0.25	A7, B2, C17, R2	A7, B2, C17, R2, W8, W18	B2, C17
8640	0.38–0.43	0.75–1.00	0.04	0.04	0.20–0.35	0.40–0.70	0.40–0.60	0.15–0.25	A7, B2, C17, R2	A7, B2, B5, C17, M12, R2, W8, W18	B2, C17
8642	0.40–0.45	0.75–1.00	0.04	0.04	0.20–0.35	0.40–0.70	0.40–0.60	0.15–0.25	A7, B2, C17, R2	A7, B2, C17, R2, W8, W18	B2, C17
8645	0.43–0.48	0.75–1.00	0.04	0.04	0.20–0.35	0.40–0.70	0.40–0.60	0.15–0.25	A7, B2, C17, R2	A7, B2, C17, R2, W8, W18	B2, C17
8647**	0.45–0.50	0.75–1.00	0.04	0.04	0.20–0.35	0.40–0.70	0.40–0.60	0.15–0.25	B2, C17, R2	B2, C17, R2, W8	B2, C17
Rycut 47	†0.47	0.87	0.020	0.024	0.29	0.58	0.50	0.21	R12	R12	.....
8650	0.48–0.53	0.75–1.00	0.04	0.04	0.20–0.35	0.40–0.70	0.40–0.60	0.15–0.25	A7, B2, C17, R2	A7, B2, B5, C17, R2, W8, W18	B2, C17
8747**	0.45–0.50	0.75–1.00	0.04	0.04	0.20–0.35	0.40–0.70	0.40–0.60	0.20–0.30	B2, C17, R2	B2, C17, R2, W8	B2, C17
Nitralloy G Mod.	0.38–0.45	0.40–0.70	0.025	0.025	0.20–0.40	(Al 0.85–1.20)	1.40–1.80	0.30–0.45	B2, C17, R2	B2, C17, R2	B2, C17
52100	0.95–1.10	0.25–0.45	0.025	0.025	0.20–0.35	.....	1.30–1.60	.....	C17	C17, P24	C17
303-Pb	0.15 max	2.00 max	.....	.....	1.00 max	7.00–10.00	17.00–19.00 (Pb + S 0.20 min)	0.60 max	Bars, wire, cold drawn, centerless ground—J6.		
Speed-Cut	0.43	0.85	0.03 max	0.03 max	0.30	.....	1.15	0.50	HR bars V2; forgings, rings, discs, all mill shapes V2.		
S5 CEC Smoothcut	0.55	0.80	.....	0.125	2.00	V 0.25	0.25	Pb 0.125	Bars—hot rolled & hammer forged; blocks; discs & ring forgings—C13.		
BD Smoothcut	0.45	0.80	.....	0.125	2.00	V 0.25	0.25	Pb 0.125	Bars—hot rolled & hammer forged; blocks; discs & ring forgings—C13.		

Key to Producers

A7 American Steel & Wire Div., U. S. Steel Corp., Cleveland.
B2 Bethlehem Steel Co., Bethlehem, Pa.
B5 Bliss & Laughlin Inc., Harvey, Ill.
C13 Columbia Tool Steel Co., Chicago Heights, Ill.
C17 Copperweld Steel Co., Warren, Ohio.
I-2 Inland Steel Co., Chicago.
J5 Jones & Laughlin Steel Corp., Pittsburgh.
J6 Joslyn Stainless Steels, division of Joslyn Mfg. & Supply Co., Chicago.
L2 LaSalle Steel Co., Chicago.
M12 Moltrup Steel Products Co., Beaver Falls, Pa.
N5 Nelsen Steel & Wire Co., Franklin Park, Ill.
P24 Peterson Steels Inc., Union, N. J.
P5 Pilgrim Drawn Steel Div., Automotive Materials Corp., Plymouth, Mich.
R2 Republic Steel Corp., Cleveland.
R12 Joseph T. Ryerson & Son Inc., Chicago.
S17 Superior Drawn Steel Co., Monaca, Pa.
V2 Vanadium Alloys Steel Co., Latrobe, Pa.
W8 Western Automatic Machine Screw Co., division of Standard Screw Co., Elyria, Ohio.
W18 Wyckoff Steel Co., Pittsburgh.
Y1 Youngstown Sheet & Tube Co., Youngstown.

Note: Designation of producers is the same as that used in STEEL's weekly price section.

*Until AISI procedure is established, leaded steels may be supplied in both standard and nonstandard ranges. **These are nonstandard steels.

†Typical analysis.

1. Alco Products Inc., Latrobe, Pa., will furnish Hi-Qua-Led leaded steel in all AISI open hearth grades in forged and rolled rings from 18 to 145 in. over-all diameter and in open-die forgings to 30,000 lb. These are designated by an "L". Thus: 10L45 for 1045, etc.
2. Producers and cold finish suppliers can furnish other grades on production orders.

APPLICATIONS: Outstanding property of leaded steels is improved machinability. Lead lubricates the cutting action of the tool—allows heavier cuts & faster speeds. Longer tool life comes from lower temperature at the tool-part interface. Better surface finish is obtained. In some cases a roughing tool may give the needed surface without a finishing operation. Leaded grades need less horsepower for machining, which is significant in handling tougher alloys.

Carbon and alloy bar grades are ideally suited for screw machine parts & other applications requiring high production rates. Typical parts being made: Nuts, bolts, screws, studs, clutch & valve parts, hand tools, spark plug shells, universal joint bearings, hose connections and lubrication fittings, pipe plugs, couplings, gears, pinions, spindles, collets, sprockets, arbors, axles, boring bars, power take-offshafts, brake dies, roller chain links and pins, air tool cylinders, shafts for door knobs, hydraulic fittings, rifle breech blocks, bushings, and rolls. Leaded steel plates are used for rubber molds, jigs, racks, gears, fixtures, die bases, rings, ring gears, and machine beds. Leaded circular forgings are used in gears, turbines, roller and ball bearings, saw mill equipment, and oil drilling rigs. Applications for hot bars and drills in forge shops are growing rapidly.

VACUUM MELTED METALS

Alloy	Source—See Key	Nominal Composition	Properties & Typical Uses
NICKEL-BASE ALLOYS			
Udimet 500	1, 2, 3, 5, 8, 13, 19, 20†	C 0.10; Cr 19.00; Mo 4.00; Ti 3.00; Al 3.00; Co 19.00; Ni bal	Applications where high strength at high temperature is required. Jet engine & gas turbine buckets, discs & bolts.
Udimet 600	5	C 0.10; Cr 18.00; Mo 4.00; Ti 3.00; Al 4.00; B 0.40 max; Co 18.00; Ni bal	High strength alloy for applications to 2000° F.
Udimet 700	5	C 0.15; Cr 17.00; Mo 4.00; Ti 4.00; Al 4.00; B 1.00 max; Co 18.00; Ni bal	Strongest wrought alloy available for applications from 1500-2000° F.
Inco 700	4, 19	C 0.14; Cr 15.00; Ni 44.00; Mo 3.00; Co 30.00; Al 3.10; Ti 2.35; Fe 1.50; B 0.005; Zr 0.05	Jet engine & gas turbine buckets, discs, bolts, etc.
Inconel 713C	21	Cr 12.00; Mo 4.50; Cb 2.00; Al 6.00; Ti 0.50; Ni bal	Jet engine blades.
Incoloy 901	12, 14, 19, 21**	C 0.10 max; Cr 12.50; Ni 42.50; Mo 6.00; Ti 2.60; B 0.10 max	High stress rupture strength with excellent ductility at 1200° F, for jet engine wheels & rings.
J-1500	2, 19	C 0.15; Cr 20.00; Co 10.00; Mo 10.00; Ti 3.00; Al 1.00; Ni bal	Exceptionally high strength in 1000 to 1600° F range. Good ductility & forgeability; for turbine buckets & jet engine components.

Alloy	Source—See Key	Nominal Composition	Properties & Typical Uses
J-1530	2, 19	C 0.08; Cr 19.50; Ni 57.00; Mo 4.30; Co 13.50; Al 1.30; Ti 3.10	Blades or high temperature parts for gas turbines.
J-1600	2, 19	C 0.10; Cr 19.00; Mo 4.00; Ti 3.00; Al 3.00; Co 19.00; Ni bal	High temperature areas in jet engines, gas turbines.
Waspaloy	1†, 2, 3, 4†, 5, 6, 8, 11†, 13, 14, 19, 20‡	C 0.08; Cr 19.50; Ni 57.00; Mo 4.30; Co 13.50; Al 1.30; Ti 3.10; Fe 1.25	High stress rupture & endurance limit; good ductility. Blades for turbojet engines.
GMR-235	1†, 2, 3, 4†, 5, 6, 8, 11†, 14, 19, 20‡	C 0.15; Cr 16.00; Ni 63.00; Mo 5.30; Al 3.20; Ti 2.20; Fe 10.00; B 0.010 max	Good ductility & high rupture strength. Used in investment cast turbine blades, vanes, wheels.
GMR-235D	3, 4†, 5, 19, 20‡	C 0.20 max; Cr 15.50; Ni bal; Mo 5.25; Al 3.60; Ti 2.50; Fe 4.25; B 0.10 max	Higher rupture strength than GMR-235. Used in same applications.
Hastelloy Alloy R-235	3	C 0.16 max; Mn 1.00 max; Si 1.00 max; Al 2.00; Ti 2.50; Fe 10.00; Mo 5.50; Cr 15.50; Co 2.25 max; Ni bal	High temperature alloy for jet engine combustion cans, afterburners, blading, etc.
Hastelloy Alloy F	3	C 0.02 max; Mn 1.50; Si 1.00 max; Cb + Ta 1.75-2.50; Ta 0.50 min; Fe 15.00; Ni bal	Corrosion resistant to both acid & alkaline solutions. Used in sulfite pulp digesters for paper.
Hastelloy Alloy X	3, 4*	C 0.15; Cr 22.00; Ni bal; Mo 9.00; Fe 19.00	Flange rings in hot end of jet engines.
D-979	1**	C 0.01; Cr 14.00; Ni 45.00; Mo 4.00; [illegible]4.00; Ti 4.00; Al 1.00; B 0.01	Used in jet engines for stresses to 1600° F. Good workability.
Unitemp 235	4*	C [illegible]6 max; Cr 15.50; Mo 5.50; Ti 2.[illegible] Al 2.00; B 0.005; Zr 0.10; Fe 10.[illegible] Ni bal	Jet engine & other hot area applications.
Unitemp 500	4*	C 0.10 max; Cr 19.00; Mo 4.00; Co 16.50; Al 3.00; Zr 0.05; B 0.005; Fe 4.00; Ni bal	Jet engine & other hot area applications.
Unitemp 901	4*	C 0.04; Cr 13.00; Ni 44.00; Mo 6.00; Ti 2.50; B 0.015	Turbine wheels & rings.
Nicrotung	10, 19	C 0.10; Cr 12.00; Co 10.00; B 0.05; Zr 0.05; W 8.00; Al 4.00; Ti 4.00; Ni bal	Highly stressed parts at 1500-1800° F. Good room temperature tensile strength, ductility, castability & oxidation resistance for gas turbine nozzle vanes & buckets.
Rene 41 (J-1610)	2, 4†, 5, 6, 8, 13, 14, 20‡	C 0.09; Cr 19.00; Co 11.00; Mo 10.00; Ti 3.10; Al 1.50; Ni bal	Good corrosion & oxidation resistance; high strength at 1600-1800° F. One of strongest materials that can be successfully formed & welded. Jet engine components.
Nimonic 80A	2, 4*, 6	C 0.04; Cr 20.50; Ni 74.50; Al 1.20; Ti 2.38	Jet engine & gas turbine buckets, discs, bolts, etc.
Nimonic 90	2, 4*, 6	C 0.08; Cr 19.00; Ni 54.00; Co 20.00; Al 1.70; Ti 2.70	Jet engine & gas turbine buckets, discs, bolts, etc.
Refractaloy 26	4*, 10**	C 0.03; Cr 18.00; Ni 38.00; Mo 3.20; Co 20.00; Ti 2.60; Al 0.20	Jet engine & gas turbine buckets, discs, bolts, etc.
K-42-B	4*, 10**	C 0.03; Cr 18.00; Ni 42.00; Co 22.00; Ti 2.10; Al 0.20; Fe bal	Jet engine & gas turbine buckets, discs, bolts, etc. Same as Nimonic 90 but with low coefficient of thermal expansion.
M-252	1*, 2, 3, 4*, 5, 6, 8, 11*, 13, 14, 19	C 0.15; Cr 19.00; Ni 56.50; Mo 9.75; Co 10.00; Al 1.10; Ti 2.50; Fe 1.25; Zr 0.06; B 0.005	High stress rupture & endurance limit with better ductility than air melted alloy. Jet engine & gas turbine buckets, discs, bolts & other hot area parts.
IRON-BASE ALLOYS			
A-286	1**, 4*, 5, 6, 7, 9**, 11*, 12**, 13*, 14, 15**, 17**, 18**, 19, 20‡	C 0.06; Mn 1.50; Si 0.70; Cr 14.80; Ni 25.50; Mo 1.30; Ti 2.00; Fe 53.50; V 0.30; B 0.003	High stress rupture & endurance limit; good transverse ductility. Wheels for turbojet engines, turbine case applications, afterburner nozzles, aircraft fastenings. Excellent hot workability of large cross sections.
Discaloy	1**, 4*, 5, 7, 10, 12**, 13, 17**, 18**, 19	C 0.06; Mn 0.80; Cr 13.50; Ni 26.00; Mo 3.00; Ti 1.67; Fe 54.00	High hot stress rupture & endurance limit; good ductility; wheels for turbojet engines.
W-545	10**	C 0.08; Mn 1.50; Si 0.40; Cr 13.50; Ni 26.00; Mo 1.50; Ti 2.85; Al 0.20; B 0.08; Fe bal	High strength bar & forging material for use up to 1350° F. Large forgings, rings & complex shafts; highly stressed parts in missiles & turbines; low temperature use in retaining rings & electrical apparatus.
M-308 (J-1300)	1*, 2, 4†, 5, 6, 7, 11†, 13†, 14, 17**, 19	C 0.08 max; Mn 0.05 max; Si 0.05 max; Cr 14.00; Ni 33.00; Mo 3.60-4.60; Al 0.25; Zr 0.25; W 6.50; Ti 2.00; Fe bal	Precipitation hardening bar & forging material for uses at temperatures up to 1350° F.
Unitemp 212	4*†	C 0.08; Cr 16.00; Ni 25.00; Cb 0.50; Ti 4.00; Al 0.35; B 0.07; Zr 0.05; Fe bal	Jet engine parts.
HS 220 (AMS 6407)	18	C 0.30; Mn 0.70; Si 0.60; Ni 2.05; Cr 1.20; Mo 0.45	Ultrastrength steel for aircraft uses; tensile strength to 240,000 psi.
HS 260	18	C 0.40; Mn 0.70; Si 0.60; Cr 1.20; Ni 2.05; Mo 0.45	Ultrastrength steel for aircraft uses; tensile strength to 280,000 psi.
SAE 4340 AISI-4340	1*, 2, 4*, 5, 6, 7, 9*, 10, 11*, 12**, 14, 15**, 18**	C 0.40; Mn 0.70; P 0.04; S 0.04; Si 0.30; Ni 1.80; Cr 0.80; Mo 0.25; Fe bal	Superstrength structural parts, airframe components, high strength gears.
VascoJet 1000 Pyromet 882	7, 20‡ 14	C 0.40; Cr 5.00; Si 0.90; Mo 1.30; V 0.50; Fe bal	Ultrahigh strength material.
ALLOY TOOL STEELS			
AISI A-2	1*, 4, 6, 7, 18	C 1.00; Mn 0.60; Si 0.20; Cr 5.25; Mo 1.10; Fe 91.50; V 0.25	Tool steel for gages & rolls.
Air Hard	7	C 1.00; Cr 5.00; Mo 1.00; V 0.40; Fe bal	High temperature alloy.
AISI D-2 (Vacumeltrol 610)	1*, 2, 4*, 5, 6, 7, 12, 14	C 1.50; Si 0.30; Mn 0.30; Cr 12.00; V 0.90; Mo 0.80; Fe bal	Nondeforming, cold work, die steel suitable for gages, thread rolling dies, drawing dies, coining dies & rolls.
Ferrovac Airdie 150 Ohio Die	6, 12** 20‡ 7	C 1.50; Cr 11.50; Mo 0.80; V 0.20; Fe bal	Jewelers' rolls for better surface finish.
AISI D-4 (M-H Diamond "B")	1*, 2, 5, 6, 7, 12**	C 2.20; Cr 12.00; Mo 1.00	Similar to D-2 but with greater wear resistance.
AISI H-11 (Thermoid A) Extrad Hotform "V"	2, 4*, 5, 9*, 14 12** 7	C 0.40; Si 0.90; Cr 5.00; Mo 1.30; V 0.50	Hot work die steel for thread rolling dies, gages, rolls.
AISI M-1	1*, 2, 4*, 5, 6, 7, 9*, 11*, 12**, 14, 18**	C 0.78; Mn 0.30; Si 0.30; V 1.15; Cr 3.75; Mo 8.55; Fe 83.50; W 1.60	Tool steel for high temperature bearings.
AISI M-2	1*, 2, 4*, 5, 6, 7, 9*, 11*, 12**, 14, 18**, 20‡	C 0.83; W 6.00; Cr 4.00; V 2.00; Mo 5.00; Fe bal	High speed steel suitable for high temperature bearings, taps, drills, chasers, broaches, milling cutters, etc.
AISI M-10	1*, 2, 4, 5, 6, 7, 9*, 11*, 12**, 18**	C 0.87; Mn 0.30; Si 0.30; Cr 4.00; Mo 7.90; Fe 84.50; V 2.00	High speed steel suitable for high temperature bearings, taps, drills, chasers, broaches, milling cutters, etc.
AISI M-50 HTB-Z	1*, 2, 4*, 5, 6, 7, 9*, 12**, 18**	Mn 0.35; Ni 0.10; W 0.25; Co 0.25; Mo 4.25; V 1.00; Cr 4.00; C 0.80; Fe bal	Bearings, hot work die steels.
AISI T-1	1*, 4, 5, 6, 7, 9*, 11*, 12**, 14, 20‡	Cr 4.00; W 18.00; V 1.10; C 0.75; Fe bal	Tool steel for high temperature bearings.
AISI T-15	1*, 2, 4*, 5, 7	C 1.50; W 13.00; Cr 4.20; V 5.00; Co 5.00; Fe bal	High speed steel with good wear resistance. Used for high temperature bearings, cutting & forming tools.

(Continued on page S-6)

VACUUM MELTED METALS (continued)

Alloy	Source—See Key	Nominal Composition	Properties & Typical Uses
Rex Super Cut	6	C 0.80; Cr 4.00; V 2.00; W 18.50; Mo 0.60; Co 8.00	Tool steel for high temperature bearings.
AISI 51100	1*, 2, 4*, 5, 6, 7, 9*, 11*, 12, 14, 15**, 18**	C 1.00; Mn 0.35; P 0.025; S 0.025; Si 0.27; Cr 1.00; Fe bal	Tool steel for bearings. Low nonmetallic content, high fatigue strength, low frictional torque. Jet engine bearings.
AISI 52100	1*, 2, 4*, 5, 6, 7, 9*, 10, 11*, 12**, 14, 15*, 18**	C 1.00; Mn 0.35; P 0.025; S 0.025; Si 0.27; Cr 1.50; Fe bal	Tool steel for bearings; properties similar to 51100
BHT	4*	C 0.82; Cr 4.00; Mo 4.20; Fe 90.00; V 0.95	Tool steel for high temperature bearings.
Halmo (Virgo)	1*, 2, 4*, 6, 9*, 11*, 18**	C 0.58; Cr 4.75; Mo 5.25; Mn 0.30; V 0.55; Si 1.12; Fe bal	Good fatigue strength for high temperature service to 500° F. Thrust bearings for main shaft of jet engines.
Teton	1	C 1.00; Cr 1.50	High compressive strength & abrasion resistance; ball & roller bearings, spindles & arbors.
Potomac A	1	C 0.40; Mn 0.30; Si 0.90; Cr 5.00; Mo 1.30; V 0.50	Aircraft sheets, forgings & fittings for high strength & resistance to softening up to 1000° F.
Potomac M	1*, 18**	C 0.40; Si 1.00; Cr 5.00; Mo 1.00; V 1.00	Hot work die steel.
Cobalt-Base Alloys			
J-1570	1*, 2, 3, 4*, 6, 19	C 0.20; Cr 20.00; Ni 28.00; Co 37.50; Ti 4.30; Fe 1.40; W 6.00	Blades or high temperature parts for gas turbines
J-1650	2, 19	C 0.20; B 0.02; Ni 27.00; Cr 19.00; Ta 2.00; W 12.00; Ti 3.80; Co bal	One of strongest wrought alloys commercially available
X-40	2, 5, 8, 20‡	Ni 10.00; Fe 1.00 max; Cr 23.00; W 7.00	High temperature areas in jet engines.
S-816 (AMS 5765A)	1*, 4*, 5, 6, 11*, 14	Co 43.00; Cr 20.00; Ni 20.00; Mn 1.50; Mo 4.00; W 4.00; Cb + Ta 4.00; C 0.38	High temperature alloy. Similar to Halmo (Virgo)
HIGH-TEMPERATURE ALLOYS			
AISI 310	1*, 4*, 5, 7, 8, 12**, 14, 15*, 18**, 20‡	C 0.25 max; Cr 25.00; Ni 20.50; Fe bal	High temperature service under corrosive conditions.
AISI 316	1*, 5, 7, 14, 15*, 20‡	C 0.08; Cr 17.00; Ni 12.00; Mo 2.50	High resistance to corrosives affecting other stainless steels; high creep resistance.
AISI 316L	4*, 5, 7, 15	C 0.03 max; Cr 17.00; Ni 12.00; Mo 2.50	Resistant to intergranular corrosion after welding or stress relieving.
AISI 347	1*, 2, 4*, 5, 6, 7, 11*, 12**, 14, 15*, 18**	C 0.08; Mn 1.90; Cr 18.00; Ni 9.90; Cb + Ta 0.90; Fe bal	Crack-free core wire for welding & miscellaneous uses. Jet engine parts in cyclical heat zone.
AISI 403	1*, 4*, 5, 7, 14, 15*	C 0.15 max; Cr 12.20; Si 0.50 max; Mn 1.00 max	Steam & gas turbine parts.
AISI 410 (AMS 5350C)	1*, 4*, 5, 7, 8, 12**, 14, 15, 18	C 0.15 max; Mn 1.00 max; Si 1.00 max; Cr 11.50-13.50; Ni 0.50 max; Fe bal	General purpose corrosion & heat resisting chromium steel.
Turbine Alloy (Type 422)	7, 12**, 15	C 0.20; W 1.00; Cr 13.00; Mo 1.00; Ni 0.75; V 0.40; Fe bal	Hardenable chromium steel; corrosion resistant.
AISI 431	4*, 5, 7, 12**, 14, 15*, 20‡	C 0.20 max; Cr 16.00; Ni 1.80	For heat treatment to high mechanical properties. Corrosion resistant.
AISI 440 B	1*, 5, 7, 15*, 20‡	C 0.85; Cr 17.00; Mo 0.50	Hardenable chromium steel; corrosion resistant.
AISI 440 C	1*, 2, 4*, 5, 6, 7, 9*, 11*, 14, 15**, 18**	C 1.05; Mn 0.375; Si 0.375; Cr 17.25; Mo 0.50; Fe 80.50	Stainless instrument bearings. Fine finish & high strength rolls.
HTB-1 MHT	1*, 6, 7, 14, 18**	C 1.03; Mn 0.35; Cr 1.45; Al 1.00	High temperature bearings for jet engines.
HTB-2	1	C 0.80; Mn 0.25; Cr 4.00; Mo 4.25; V 1.00	Jet engine & other high temperature applications.
HTB-3	1	C 0.57; Mn 0.30; Si 1.15; Cr 4.75; Mo 5.25; V 0.55	Jet engine & other high temperature applications.
AF 1753	13	C 0.25; Cr 16.50; W 8.50; Mo 1.50; Co 7.50; Ti 3.15; Al 2.00; B 0.008; Zr 0.05; Fe 9.50; Ni bal	High temperature alloy with good hot workability.
Greek Ascoloy (Uniloy 1415NW)	1*, 7, 9*, 15*, 20‡	C 0.18; Cr 13.00; W 3.00; Ni 2.00; Fe bal	Heat resisting steel for jet engine compressor blades, turbine discs & auxiliary parts.
Uniloy N-155	1*	C 0.10; Cr 20.75; Ni 19.85; Co 19.50; Mo 2.95; W 2.35; Cb + Ta 1.15; N 0.13	High strength to 1500° F; oxidation resistant to 1800° F. Jet engine tail pipes & afterburners, combustion chambers, nozzle assemblies, bolts, buckets, discs.
Uniloy 17-4 Mo	1*	C 0.10; Cr 16.50; Ni 4.50; Mo 2.85; N 0.10	Hardenable stainless grade. High strength corrosion & heat resisting.
Uniloy 16-4 Mo	1*	C 0.12; Cr 15.50; Ni 4.50; Mo 2.85; N 0.10	Similar to 17-4 Mo.
Armco 17-4 PH	1, 8, 12**, 20‡	C 0.07 max; Mn 1.00; Si 1.00; Cr 16.50; Ni 4.00; Mo 0.50 max; P 0.04 max; S 0.03 max; Cu 4.00; Cb 0.35; Fe bal	Castings for high strength, corrosion & heat resistance.
Lapelloy	1**, 4*, 7, 9*, 14, 15, 18	C 0.30; Cr 11.50; Mo 2.75; Ni 0.35; V 0.25; Fe bal	Gas turbine compressor discs & parts. Flange rings.
Lapelloy "C"	14	C 0.20; Mn 0.65-1.00; Si 0.50 max; Cr 11.00-12.00; Ni 0.50 max; Mo 2.50-3.00; P 0.03 max; S 0.03 max; Cu 1.75-2.25; N 0.06-0.10	Similar to Lapelloy but with greater ductility & impact strength.
Inductovac MCS	4*	C 0.70; Si 1.05; Cr 3.50; Mo 5.50	High temperature bearings.
TBS-600	18	C 0.95-1.10; Mn 0.60-0.80; P 0.025 max; S 0.025 max; Si 0.85-1.20; Cr 1.25-1.65; Mo 0.25-0.35	Bearing steel for high hardness & wear resistance to 600° F.
CBS-600	18	C 0.16-0.22; Mn 0.50-0.70; P 0.040 max; S 0.040 max; Si 0.90-1.25; Cr 1.25-1.65; Mo 0.90-1.10	Bearing steel for high hardness & wear resistance to 600° F.
Inductovac 18-8E Ferrovac 304 B	4, 6	C 0.06; Cr 19.00; Ni 9.50; Fe 69.00; B 2.15	Atomic energy applications, such as neutron control rods.
Inductovac 18-15B	4	C 0.01; Mn 1.20; Cr 18.00; Ni 15.00; Fe 65.00; B 0.80	Atomic energy applications, such as neutron control rods.
19-9 DL	4*, 14	C 0.32; Cr 18.50; Ni 9.00; Mo 1.40; W 1.35; Cb + Ta 0.40; Ti 0.25	High temperature use in jet engine, gas turbine & turbosuperchargers as rotors, buckets, bolts, manifolds, tail cones.
19-9 DX	4*, 14	C 0.32; Cr 18.50; Ni 9.00; Mo 1.60; W 1.35; Ti 0.55	Cb-free alloy. Same as 19-9 DL.
V.S.M.	14	C 0.70; Mn 0.50; Si 1.10; Cr 3.00; Mo 5.25	High hot hardness, resistant to wear & abrasion at elevated temperatures. Used for valve seat inserts & stems, slides, guides, spindles, bearings.
AMS-5382 B PWA-651	8	C 0.35-0.45; Mn 2.00-3.00; Si 1.00 max; Cr 25.50; Mo 2.00-4.00; Fe 5.00 max; Co bal; W 7.50; S 0.03 max; Ni 10.50	Castings for high temperature aircraft service.
Silmo-Vac	7	C 0.58; Mo 5.00; Cr 4.75; Mn 0.30; V 0.55; S 1.10; Fe bal	High temperature bearings.

Alloy	Source—See Key	Nominal Composition	Properties & Typical Uses
MISCELLANEOUS ALLOYS			
Unimach #1	4*	C 0.40; Si 1.00; Cr 5.00; Mo 1.40; V 0.45	Structural steels for high temperature service.
Unimach #2	4*	C 0.50; Si 1.00; Cr 5.00; Ni 1.50; Mo 1.40; V 1.00	Structural steels for high temperature service.
Peerless 56	6	C 0.40; Mn 0.55; Si 1.00; Cr 3.25; Mo 2.50; V 0.33	Superstrength structural parts, airframe components, high strength gears.
VDC	9*	C 0.40; Si 1.00; Mn 0.30; Cr 5.25; Mo 1.25; V 1.00	High strength steel for aircraft structural applications.
AISI 6150	1*, 2, 4*, 5, 6, 7, 9*, 11*, 12**, 14, 15**, 18**	C 0.52; Mn 0.80; Si 0.30; Cr 0.95; Fe 97.56; V 0.21	High endurance limit, low nonmetallic inclusions. Aircraft valve springs, fasteners.
AMS-6260E AISI-9310 SAE-9310	2, 4*, 5, 6, 7, 9*, 11*, 12**, 15*, 18**	C 0.10; Ni 3.20; Cr 1.20; Mn 0.55; Si 0.25	Gear alloy, for critical aircraft gears.
AMS-6264C SAE-9317	4*, 5, 7, 15*	C 0.16; Ni 3.25; Cr 1.20; Mn 0.55; Mo 0.12	High strength steel.
Magnetic alloy	8, 10	C 0.75; W 5.00; Si 0.20-0.35; Cr 4.00; Co 0.39; Fe bal	Castings & wrought forms for magnetic applications.
Polar	19	Modified 1020 steel	Magnetron pole pieces & special applications requiring vacuum tight seal.
Alnico	19	Co, Ni, Al, Fe	Permanent magnets for high energy, high quality applications.
Core Iron	14, 20‡	C 0.06 max; Mn 0.20 max; Si 0.25 max; V 0.10 max; Fe bal	For direct current magnetic applications in solenoids, armatures & assemblies subject to high vacuum; free from magnetic aging.
Kovar	8, 10	Co 17.00; Ni 29.00; Fe 54.00	Glass sealing alloy.
Thermenol	1, 4, 6	C 0.03; Mo 3.30; Al 15.40; Fe 81.27	Magnetic & heat resistant uses.
Alfenol	4, 6, 14	C 0.01; Al 15.85; Fe 84.00	Magnetic & heat resistant uses.
HyMu "80"	14	C 0.05; Mn 0.50; Si 0.15; Ni 79.00; Mo 4.00; Fe bal	For transformer cores, tape wound toroids & laminations where compactness & weight factors are important.
Cuprovac E (Copper)	2, 6, 20‡	99.95 + per cent copper	High purity, low gas content; low nonmetallics, low high vapor pressure elements. Vacuum tubes in electronics industry, transmitting tubes, magnetrons.
Nivac P (Nickel)	2, 6	99.92 + per cent nickel	Properties similar to above. Vacuum tubes for electronics industry, hydrogen thyratrons, magnetrons, etc.
Ferrovac E (Iron)	2, 6	99.92 + per cent iron	Properties similar to above. Magnetic alloys, vacuum tubes for electronics industry, magnetrons, klystrons, etc.
Ferrovac 49-2 V Supermendur	6 10	Co 49.00; Fe 49.00; V 2.00	High saturation, high permeability magnetic alloy.
Ferrovac 50% Ni Hipernik	6 10, 20‡	Ni 50.00; Fe 50.00	High permeability, low coercive force magnetic alloy.
Ferrovac 42% Ni	6	Ni 42.00; Fe 58.00	High permeability, low coercive force magnetic alloy.
Ferrovac Type 304	6	C 0.08 max; Mn 2.00 max; Si 1.00 max; Ni 8.00-12.00; Cr 18.00-20.00	Electronic tubes.
Rodar	16	Ni 29.00; Co 17.00; Mn 0.30; Fe bal	Glass sealing alloy.
Cathode Nickel	16	Ni 99.00 (+Co) min	Vacuum tube alloy.
32 Alloy	16	Cu 98.50 min; Ni 1.00; P 0.20	High conductivity, high strength alloy for vacuum tubes.
Molybdenum	4**	(1) Pure (2) + Ti 0.50	Jet engine parts.

KEY TO SOURCE:
(1) Allegheny Ludlum Steel Corp., Pittsburgh.
(2) Metallurgical Products Dept., General Electric Co., Detroit.
(3) Haynes Stellite Co., division of Union Carbide Corp., New York.
(4) Universal-Cyclops Steel Corp., Bridgeville, Pa.
(5) Metals Div., Kelsey-Hayes Co., Utica, N. Y.
(6) Vacuum Metals Div., Crucible Steel Co. of America, Syracuse, N. Y.
(7) Vanadium-Alloys Steel Co., Latrobe, Pa.
(8) Cannon-Muskegon, Inc., Muskegon, Mich.
(9) Latrobe Steel Co., Latrobe, Pa.
(10) Westinghouse Electric Corp., Blairsville, Pa.
(11) Johnston & Funk Metallurgical Corp., Wooster, Ohio.
(12) Midvale-Heppenstall Co., Philadelphia.
(13) Firth Sterling Inc., Pittsburgh.
(14) Carpenter Steel Co., Reading, Pa.
(15) Republic Steel Corp., Cleveland.
(16) Wilbur B. Driver Co., Newark, N. J.
(17) Oregon Metallurgical Corp., Albany, Oreg.
(18) Timken Roller Bearing Co., Canton, Ohio.
(19) Allvac Metals Co., Monroe, N. C.
(20) Spaulding Cast Products Div., Crucible Steel Co. of America, Harrison, N. J.
(21) International Nickel Co. Inc., New York.
*All alloys are induction vacuum melted unless source is marked with asterisk, which indicates a consumable electrode melted grade is also available.
**Indicates only consumable electrode melted grade is available.
†Research indicates that combination induction vacuum, consumable vacuum may be advisable for improved hot workability.
‡Indicates these alloys are made as cast products only.

SPRING ALLOYS

Name & Specification	Nominal Composition*	Properties & Typical Uses
HIGH CARBON		
Music Wire ASTM A228-51 AMS-5112	C 0.70-1.00; Mn 0.20-0.60	Widely used for small springs. High tensile strength; stands high stresses. Temperature limit: 250° F. Torsion working stress 90,000-180,000 psi; bending working stress 150,000-350,000 psi.
MB Grade Oil Tempered ASTM A229-41	C 0.55-0.75; Mn 0.60-1.20	General purpose steel for coil springs where cost of music wire is prohibitive, or in larger sizes than available in music wire. Not recommended for shock, impact loading, or use above 350° F. Torsion working stress 80,000-130,000 psi; bending working stress 120,000-250,000 psi.
MB Grade Hard Drawn ASTM A227-47	C 0.45-0.75; Mn 0.60-1.20	Cheapest spring steel for general purposes. Used where accuracy of loads and deflections not important. Temperature limit: 250° F. Torsion working stress 75,000-130,000 psi; bending working stress 100,000-200,000 psi.
MB Grade Soft or Untempered	C 0.55-0.75; Mn 0.60-1.20	Used in helical springs or wire forms where severe forming is required. May be obtained dead soft (annealed at final size) or drawn one or more drafts after heat treatment. Hardened and tempered after fabrication.
HB Grade Hard Drawn	C 0.71-0.85; Mn 0.60-0.90	Uses similar to hard drawn MB grade. Tensile strength higher than hard drawn MB grade, but lower than music wire. Uses are about halfway between the two.
Extra HB Grade Soft	C 0.86-1.05; Mn 0.30-0.60	Applications same as HB grade.
Upholstery Grade	C 0.45-0.70; Mn 0.60-1.20	Not suitable for precision springs. Used where loads and fatigue life are not a factor. Examples: Wire forms & hooks, mattress & upholstery springs.
FLAT HIGH CARBON		
Cold Rolled Flat Spring Steel, Hard Rolled or Annealed	C 0.18-0.65; Mn 0.60-0.90	Used for miscellaneous springs & washers. In annealed condition will withstand more severe deformation than the 0.65-0.80 carbon grade.
Cold Rolled Spring Steel, Tempered or Annealed	C 0.65-0.80; Mn 0.30-0.90	Most popular flat cold-rolled spring steel. Used for spring clips, flat springs, motor power, spiral springs.
Cold Rolled Spring Steel, Tempered or Annealed	C 0.90-1.05; Mn 0.30-0.50	Used principally for clock & motor springs. Can withstand higher stress than the 0.65-0.80 carbon grade. Used for instrument & flat springs that have limited forming requirements.
ALLOY STEELS		
Chrome-Vanadium ASTM A231-41 SAE 6150	C 0.48-0.53; Mn 0.70-0.90; Cr 0.80-1.10; Si 0.20-0.35; V 0.15 min	Good for shock, impact loading, & temperatures up to 425° F. Torsion working stress 100,000-130,000 psi; bending working stress 180,000-230,000 psi.

(Continued on page S-8)

SPRING ALLOYS (continued)

Name & Specification	Nominal Composition*	Properties & Typical Uses
Silicon-Manganese ASTM A59-49 SAE 9260	C 0.55-0.65; Mn 0.70-1.00; Si 1.80-2.20	Used in flat leaf springs for trucks and as a substitute for more expensive steels. Not recommended in pretempered wire.
Chrome-Silicon SAE 9254	C 0.50-0.60; Mn 0.50-0.80; Si 1.20-1.60; Cr 0.50-0.80	For highly stressed springs requiring long life that are subject to shock loading, such as recoil springs on guns. Can be heat treated to Rc 50-53. May be used up to 475° F. Torsion working stress 115,000-150,000 psi; bending working stress 190,000-240,000 psi.
Chrome-Moly-Nickel AISI 8650 ASTM A332-51T Grade 8650	C 0.48-0.53; Mn 0.75-1.00; Si 0.20-0.35; Ni 0.40-0.70; Cr 0.40-0.60; Mo 0.15-0.25	Developed as an alternate for chrome-vanadium SAE 6150. Used in large sections for hot-formed springs in railroad cars.
Chrome-Moly-Nickel AISI 8660 ASTM A332-51T Grade 8660	C 0.55-0.65; Mn 0.75-1.00; Si 0.20-0.35; Cr 0.40-0.60; Ni 0.40-0.70; Mo 0.15-0.25	Uses same as for AISI 8650.
VALVE SPRING STEELS		
High Carbon Valve Spring Wire ASTM A230-47	C 0.60-0.75; Mn 0.50-0.90; Si 0.12-0.30	Valve springs in automotive and aircraft engines and other springs requiring high fatigue properties. Uniform properties, smooth finish, and tensile strengths of 195,000-250,000 psi.
Chrome-Vanadium Valve Spring Wire ASTM A232-47 AMS-6450	C 0.45-0.55; Mn 0.60-0.90; Si 0.12-0.30; Cr 0.80-1.10; V 0.15-0.25	Automotive and aircraft valve springs. Stands high stresses, shock and impact loading up to 400° F, with long fatigue life.
STAINLESS STEELS		
Types 301 and 302	Ni 7.00-10.00; Cr 17.00-19.00; C 0.15 max	Furnished in reasonably high tensile strength with lower permeability than carbon steels. Magnetic when worked to spring temper. General purpose corrosion resistance uses. Can be used to 550° F. Torsion working stress 45,000-140,000 psi; bending working stress 60,000-260,000 psi.
Type 316	Ni 10.00-14.00; Cr 16.00-18.00; Mo 2.00-3.00; Mn 2.00; C 0.08 max	Addition of Mo increases corrosion resistance to most chemicals, particularly the halogens. Lower tensile than 302 for similar amounts of cold reduction. Torsion working stress 40,000-120,000 psi; bending working stress 55,000-220,000 psi.
17-7 PH	Ni 7.00; Cr 17.00; C 0.07; Al 1.00	Good corrosion resistance. Can be used up to 700° F. Torsion working stress 134,000-160,000 psi; bending working stress 195,000-225,000 psi.
Types 410 and 420	Cr 12.00-14.00	Only used for springs in the heat treated condition. Hardened after forming. Not corrosion resistant unless polished.
COPPER BASE-ALLOYS		
Electrolytic Tough Pitch	Cu 99.90	Has best electrical conductivity of copper and copper-base alloys supplied in spring temper. Used in radio parts and electrical switches.
Gilding, 95%	Cu 95.00; Zn 5.00	Rolled strip supplied in spring temper.
Commercial Bronze, 90%	Cu 90.00; Zn 10.00	Flat products and wire supplied in spring temper.
Jewelry Bronze, 87.50%	Cu 87.50; Zn 12.50	Flat products and wire supplied in spring temper.
Red Brass, 85%	Cu 85.00; Zn 15.00	Flat products and wire supplied in spring temper.
Low Brass, 80%	Cu 80.00; Zn 20.00	Flat products and wire supplied in spring temper.
Cartridge Brass, 70% ASTM B134-51 SAE 80	Cu 70.00; Zn 30.00	A hard-drawn material usually used in the spring-hard temper. Inexpensive, high electrical conductivity, low tensile strength. Used in flat stampings where sharp bends are needed.
Yellow Brass	Cu 65.00; Zn 35.00	Flat products and wire supplied in spring temper.
Phosphor Bronze, 5% (A)	Cu 94.00; Sn 3.50-5.80; P 0.03-0.35	Combines good strength, hardness, electrical conductivity, corrosion resistance with low cost. Used for contact fingers in switches. Useful up to 212° F.
Phosphor Bronze, 8% (C)	Cu 92.00; Sn 7.00-9.00; P 0.03-0.35	Used for more severe service than the 5% alloy. Typical uses: Cotter pins, diaphragms, fuse clips, switch parts, wire brushes.
Phosphor Bronze, 10% (D)	Cu 90.00; Sn 9.00-11.00; P 0.03-0.35	Heavy bars and plates for severe compression, good wear, and corrosion resistance. Used for parts requiring extra spring qualities, greater resiliency, particularly in fatigue.
Nickel Silver, 55-18	Cu 55.00; Ni 18.00; Zn 27.00	The nickel silver alloys have a silvery white color that harmonizes with surroundings. Used for contact fingers. Good electrical conductivity, corrosion resistance.
Nickel Silver, 65-10	Cu 65.00; Ni 10.00; Zn 25.00	Better electrical conductivity than the 55-18 grade. Spring temper supplied in wire only.
Beryllium Copper ASTM B194-55 (flat springs) ASTM B196-52 (round sections)	Cu 98.00; Be 2.00	Electrical switches and components. Can be formed in annealed condition and precipitation hardened to get high tensile strength.
High-Silicon Bronze (A) ASTM B97	Cu 94.80; Si 2.80-3.50; can have small amounts of Fe, Zn, Mn, or Ni	Silicon bronze has excellent resistance to corrosion. Useful for applications requiring large tonnages.
NICKEL-BASE ALLOYS		
Monel QQ-N-281a Cl. A MIL-N-894 C (Cl. A)	Ni 67.00; Cu 30.00	Resists sea water corrosion, is nearly nonmagnetic. Often used in food and beverage equipment. Torsion working stress 50,000-63,000 psi; bending working stress 88,000-107,000 psi. Temperature range: —100 to 400° F.
"K" Monel QQ-N-286a MIL-W-4471 (Comp. A) MIL-N-17506A (Cl. A)	Ni 63.00-70.00; Al 2.00-4.00; Ti 0.25-1.00; Cu bal	A precipitation hardening alloy. Age hardening gives a higher tensile strength than Monel. Nonmagnetic and can be used at temperatures of —100 to 450° F at working stresses under 45,000 psi. Torsion working stress 60,000-70,000 psi; bending working stress 110,000-120,000 psi.
Inconel QQ-W-390a	Ni 72.00 min; Cr 14.00-17.00; Fe 6.00-10.00	Nonmagnetic, good corrosion resistance, stands temperatures up to 650° F. Useful at subzero temperatures. Used in steam valves, regulating valves, springs in boilers, compressors, turbines, jet engines. Torsion working stress 55,000-80,000 psi; bending working stress 110,000-135,000 psi.
Inconel "X" AMS-5698 AMS-5699	Ni 70.00 min; Cr 14.00-17.00; Fe 5.00-9.00; Ti 2.00-2.50; Al 0.40-1.00; Cb 0.70-1.20	A precipitation hardening alloy. Nonmagnetic and can be used in larger sections than Inconel at higher tensile strengths. May be used up to 1100° F, depending on design stresses. Useful at subzero temperatures. Torsion working stress 55,000-85,000 psi; bending working stress 110,000-135,000 psi.
COBALT-BASE ALLOYS		
Elgiloy S J Alloy Durapower Cobenium Dynavar	Co 40.00; Cr 20.00; Ni 15.00; Mo 7.00; Mg 2.00; C 0.15; Be 0.04; Fe bal Ni 13.00; Fe 17.00; Cr 2.00; Co 42.00; W 2.50	Used for power, compression, extension, torsion and leaf springs. Fatigue and set resistant. High corrosion resistance, nonmagnetic, low hysteresis and drift. Torsion working stress 125,000 psi; bending working stress 250,000 psi. For applications from —85 to 1000° F. Suitable for subzero and up to 750° F temperatures, provided torsional stresses are kept under 75,000 psi. Used in watches and instruments for springs and diaphragms.
S 816	Co 43.00; Ni 20.00; Cr 20.00; Mo 4.00; W 4.00; Cb 4.00; Fe 3.00	Similar to Dynavar and 17-7 PH with better high temperature properties. Used for instrument & watch springs.
CONSTANT MODULUS ALLOYS		
Ni-Span-C Elinvar Extra	Ni 41.00-43.00; Cr 4.90-5.50; Ti 2.10-2.50; Fe bal	Precipitation hardening alloy. Excellent thermoelastic characteristics over the range of —50 to 150° F. Torsion working stress 60,000 psi; bending working stress 15,000-110,000 psi. Used in control, timing, & measuring equipment.
Iso-Elastic	Ni 35.00-37.00; Cr 7.00-7.60; Mo 0.35-0.70; Fe bal	Used principally in cynamometers, instruments, and food weighing scales. Its temperature compensating characteristics meet requirements of national and state boards of weights and measures. Torsion working stress 40,000-60,000 psi; bending working stress 90,000-100,000 psi.

*Only major elements listed.

CAST HIGH ALLOYS — Corrosion & Heat Resistant

ACI Designation	Equiv. (Wrought)	Nominal Composition	Outstanding Properties & Typical Uses
CA-15	410	C 0.15 max; Mn 1.00 max; Si 1.50 max; Cr 11.5-14.0; Ni 1.0 max; Mo 0.5 max; Fe bal	Hardenability, 144 to 400 BHN. Good atmospheric corrosion resistance. Pump casings, bushings & liners, impellers, shafts, turbine blades, stuffing boxes, valve bodies & trim, fittings, furnace burner tips, & pilot cones.
CA-40	420	C 0.20-0.40; Mn 1.00 max; Si 1.50 max; Cr 11.5-14.0; Ni 1.0 max; Mo 0.5 max; Fe bal	Hardenability, up to 500 BHN. Corrosion resistance same as CA-15. Choppers, cutting blades, cylinder liners, pump parts, steam turbine parts, molds, dies.
CB-30	431	C 0.30 max; Mn 1.00 max; Si 1.00 max; Cr 18-22; Ni 2.0; Fe bal	Resists nitric acid, alkali, & many organic chemicals. Good machinability. Furnace brackets & hangers, pump parts, rabble arms, tube supports, valve bodies & parts.
CC-50	446	C 0.50 max; Mn 1.00 max; Si 1.00 max; Cr 26-30; Ni 4.0 max; Fe bal	Magnetic, good machinability; resists dilute sulfuric acid, mixed nitric & sulfuric acids, & oxidizing acids. Bushings, cylinder liners, pump casings & impellers, valve bodies & seats.
CE-30	312	C 0.30 max; Mn 1.50 max; Si 2.00 max; Cr 26-30; Ni 8-11; Fe bal	Better strength & ductility than CC-50; useful where castings cannot be heat treated. Resists sulfurous acid & sulfites. Process industry equipment such as digester fittings, fractionating towers, pipings, pump bodies & casings, valve bodies & parts.
CF-8	304	C 0.08 max; Mn 1.50 max; Si 2.00 max; Cr 18-21; Ni 8-11; Fe bal	High impact strength at low temperatures. Resists strong oxidants such as boiling nitric acid. Autoclaves, blast furnace bushings, filter press plates, hardware, headers & heating coils, pump parts, spray nozzles, valve parts.
CF-20	302	C 0.20 max; Mn 1.50 max; Si 2.00 max; Cr 18-21; Ni 8-11; Fe bal	High ductility & impact strength. Satisfactory in many oxidizing environments. Cylinder liners, pumps, return bends, rolls, circuit breaker parts, valve parts.
CF-8M	316	C 0.08 max; Mn 1.50 max; Si 2.00 max; Cr 18-21; Ni 9-12; Mo 2.0-3.0; Fe bal	Used up to 1000° F—ductile & strong. Resists reducing solutions & pitting corrosion in sea water. Agitators, evaporator parts, jet engine components, spray nozzles, high pressure steam valves.
CF-12M	316	C 0.12 max; Mn 1.50 max; Si 2.00 max; Cr 18-21; Ni 9-12; Mo 2.0-3.0; Fe bal	Preferred over CF-8M for operating temperatures above 1200° F; corrosion resistance not quite as good as CF-8M. Agitators, evaporator parts, jet engine components, spray nozzles, high pressure steam valves.
CF-8C	347	C 0.08 max; Mn 1.50 max; Si 2.00 max; Cr 18-21; Ni 9-12; Cb 8 x C min, 1.0 max or Cb + Ta 10 x C min, 1.35 max; Fe bal	Suitable for field welding. Corrosion resistance similar to CF-8. Aircraft shroud assemblies, autoclaves, chemical tubing, fittings, jet engine parts, marine fittings.
CF-16F	303	C 0.16 max; Mn 1.50 max; Si 2.00 max; Cr 18-21; Ni 9-12; Se 0.20-0.35; Mo 1.50 max; P 0.17 max; Fe bal	Improved machinability, good welding characteristics. Corrosion resistance inferior to CF-20, but adequate for many purposes. Bearings, bushings, fittings, pump & machinery parts.
CH-20	309	C 0.20 max; Mn 1.50 max; Si 2.00 max; Cr 22-26; Ni 12-15; Fe bal	More ductile than CE-30 but not as strong; stronger than CF-8 but not as ductile. Resists hot dilute sulfuric acid. Digester fittings, roasting equipment, valves.
CK-20	310	C 0.20 max; Mn 1.50 max; Si 2.00 max; Cr 23-27; Ni 19-22; Fe bal	Withstands elevated temperatures, resists dilute sulfuric acid. Digesters, filter press parts, fittings, jet engine parts, pumps, valves.
CN-7M	...	C 0.07 max; Mn 1.50 max; Si 1.50 max; Cr 19-22; Ni 27.5-30.5; Mo 1.75-2.50; Cu 3.00 min; Fe bal	Good machining & fair welding properties, nonmagnetic. Resists: Sulfuric acid, reducing chemicals, dilute hydrochloric acid, hot chlorides & nitric acid. Filter parts, heat exchanger parts, pickling rolls, hooks & racks.
HA	...	C 0.20 max; Mn 0.35-0.65; Si 1.00 max; Mo 0.90-1.20; Cr 8-10; Fe bal	Maximum use temperature: 1300° F. Fan blades for hot gases, trunnions for glass rolls.
HC	446	C 0.50 max; Mn 1.00 max; Si 2.00 max; Mo 0.5 max; Cr 26-30; Ni 4 max; Fe bal	Maximum use temperature: 1200° F with moderately heavy loading; 1900° F with light loading. Used in sulfur atmosphere when heavy loading is not involved; in ore roasting furnaces for parts such as rabble arms and blades.
HD	327	C 0.50 max; Mn 1.50 max; Si 2.00 max; Mo 0.5 max; Cr 26-30; Ni 4-7; Fe bal	Properties & uses same as Type HC with greater strength at elevated temperatures. Useful in sulfur atmospheres. Ore roasting furnace parts, salt pots, grate bars.
HE	312	C 0.20-0.50; Mn 2.00 max; Si 2.00 max; Mo 0.5 max; Cr 26-30; Ni 8-11; Fe bal	Maximum use temperature: 2000° F. Good corrosion resistance & ductility; moderate strength at elevated temperatures. Stands sulfur atmospheres.
HF	302B	C 0.20-0.40; Mn 2.00 max; Si 2.00 max; Mo 0.5 max; Cr 19-23; Ni 9-12; Fe bal	Maximum use temperature: 1600° F. Good corrosion resistance in the range 1200-1600° F. Oil refineries for tube supports & beams; cement mill parts, ore roasting furnace parts, heat treating furnaces.
HH	309	C 0.20-0.50; Mn 2.00 max; Si 2.00 max; Mo 0.5 max; N 0.2 max; Cr 24-28; Ni 11-14; Fe bal	Maximum use temperature: 2000° F. High strength & oxidation resistance at elevated temperatures. Depending on composition, the alloy can be partially ferritic or fully austenitic. Tube supports & beams in oil refineries, ore roasting furnace parts & heat treating parts.
HI	...	C 0.20-0.50; Mn 2.00 max; Si 2.00 max; Mo 0.5 max; Cr 26-30; Ni 14-18; Fe bal	Maximum use temperature: 2150° F. Cast retorts for magnesium production.
HK	310	C 0.20-0.60; Mn 2.00 max; Si 2.00 max; Mo 0.5 max; Cr 24-28; Ni 18-22; Fe bal	Maximum use temperature: 2100° F. Resists hot gas corrosion better than Type HH. Not recommended where severe thermal shock is involved. Used where high creep strength is needed; jet engines, gas turbines, furnace parts.
HL	...	C 0.20-0.60; Mn 2.00 max; Si 2.00 max; Mo 0.5 max; Cr 28-32; Ni 18-22; Fe bal	Maximum use temperature: 1800° F. Good corrosion resistance in sulfur atmospheres. Gas dissociation equipment, fixtures.
HN	...	C 0.20-0.50; Mn 2.00 max; Si 2.00 max; Mo 0.5 max; Cr 19-23; Ni 23-27; Fe bal	Good high temperature strength & corrosion resistance in chemically reactive media. Brazing fixtures for use up to 2060° F.
HT	330	C 0.35-0.75; Mn 2.00 max; Si 2.50 max; Mo 0.5 max; Cr 13-17; Ni 33-37; Fe bal	Maximum use temperature: 2100° F in oxidizing & 2000° F in reducing atmospheres. Excellent service life where subject to rapid heating & cooling. Heat treating furnace parts such as rails, rolls, discs, chains, boxes, pots & fixtures subject to cyclic heating. Also used for glass rolls, enameling racks.
HU	...	C 0.35-0.75; Mn 2.00 max; Si 2.50 max; Mo 0.5 max; Cr 17-21; Ni 37-41; Fe bal	Strength & corrosion resistance at high temperatures; similar to HT. Used where improved resistance to hot gas corrosion is required.
HW	...	C 0.35-0.75; Mn 2.00 max; Si 2.50 max; Mo 0.5 max; Cr 10-14; Ni 58-62; Fe bal	Maximum use temperature: 2050° F in oxidizing, 1900° F in reducing atmospheres. Excellent for severe service at high temperatures involving cyclic heating or thermal shock. Hearths, muffles, retorts, trays, boxes, burner parts, enameling fixtures, quenching fixtures, molten lead containers.
HX	...	Cr 0.35-0.75; Mn 2.00 max; Si 2.50 max; Mo 0.5 max; Cr 15-19; Ni 64-68; Fe bal	Maximum use temperatures same as HW, but better in resistance to reducing gases containing sulfur at 1800° F. Used in contact with tempering & cyaniding salts. Same applications as HW, improved resistance to hot gas corrosion.

NOTES:
1. Molybdenum is not intentionally added to any composition. Sulfur does not exceed 0.04 per cent in any composition. Except for Type CF-16F, phosphorus does not exceed 0.04 per cent in any composition.
2. Most of the standard grades listed are covered for general applications by American Society for Testing Materials specifications A 296-55 & A 297-55. ASTM specifications A 217-55, A 351-52T, A 362-52T, B 190-50 & B 207-50 also apply to some of the grades.
3. Cast alloy chemical composition ranges *are not the same* as the wrought alloys. Buyers should use cast alloy designations for proper identification of castings.

COPPER ALLOYS

Wrought alloys not listed in the Copper & Brass Research Association's Manual of Standard Alloys

Name & Producer	Nominal Composition	Forms & Applications
High-Thermo (Mod. Electrolytic Tough Pitch) Phelps Dodge Copper Products Corp.	Cu 99.90 (Plus small quantity of an element added to increase resistance to annealing.)	Wire, bars, commutator section stock—High conductivity electrical applications, as in transmission lines, bus bars, commutator segments, where greater retention of high tensile is desired at temperatures that normally soften electrolytic copper.
Tellurium Copper Chase Brass & Copper Co.	Cu 99.50; Te 0.50	Rods—Screw machine & other parts requiring a high conductivity.
Tellurium Copper, 033 Scovill Mfg. Co.	Cu 99.50; Te 0.50	Rods—Screw machine products.
Tellurium Copper, 799 Mueller Brass Co.	Cu 99.50; Te 0.50	Rods, bars, die-pressed forgings—Gas-cutting torch & welding tips, screw machine parts.
Revere Free Cutting Copper (Tellurium Bearing Copper) Revere Copper & Brass Inc.	Cu 99.50; Te 0.50; P 0.007 max.	Rods, extruded shapes, forgings—Electrical parts, welding tips.
Tellurium Copper, 127 American Brass Co.	Cu 99.49; Te 0.50; P 0.01	Rods, bars, die-pressed forgings—Gas-cutting torch & welding tips.
Chromium Copper, 999 American Brass Co.	Cu 99.05; Si 0.10; Cr 0.85	Sheets, strip, plates, wire, rods, bars—Switches, circuit breakers, contact points on resistance welding electrodes, grid supports, vacuum tubes.
Chromium Copper, 902 Mueller Brass Co.	Cu 99.05; Si 0.10; Cr 0.85	Sheets, strip, plates, wire, rods, bars—Switches, circuit breakers, contact points on resistance welding electrodes, grid supports, vacuum tubes.
Ampcoloy, 97 (Chromium Copper) Ampco Metal Inc.	Cu 99.00; Cr 1.00	Rods, bars, shapes, forgings, plates, castings—Spotwelding tips, seamwelder rolls, flashwelding dies, electrical contacts, Properzi wheels, commutator segments, rotor bars, plating rolls.
Hitenso, 961 (Cadmium Copper) American Brass Co.	Cu 99.00; Cd 1.00	Sheets, strip, plates, wire, rods, bars—Electrical conductors, electrodes for resistance welding.
Phosnic Bronze (Nickel-Phosphorus Bronze) Chase Brass & Copper Co.	Cu 98.65; Ni 1.10; P 0.25	Rods—Rivets, screws, springs, electrical parts.
Hitenso, 965 (Cadmium Bronze) American Brass Co.	Cu 98.60; Sn 0.60; Cd 0.80	Sheets, strip, plates, wire, rods, bars—Wire & cable for electrical conductors.
Teinic Bronze (Nickel-Phosphorus Bronze) Chase Brass & Copper Co.	Cu 98.15; Ni 1.10; Te 0.50; P 0.25	Rods—Forgings & screw machine parts requiring high strength, good conductivity.
Olympic-Type B Chase Brass & Copper Co.	Cu 97.50; Si 1.50; Zn 1.00	Wire, rods—Bolts & nuts.
Silnic Bronze Chase Brass & Copper Co.	Ni 1.90; Si 0.06; Pb 0.10 max; Fe 0.10 max; Zn 0.50 max; total of other elements 0.20 max; Cu remainder.	Wire, rods, bars—Bolts & nuts, pole line hardware, valve stems, electrical contacts, shafts.
Olympic-Type A Chase Brass & Copper Co.	Cu 96.00; Si 3.00; Zn 1.00	Sheets, strip—Bearing plates, evaporators, certain marine hardware, special tanks.
Everdur, 1012 (Leaded Silicon Bronze) American Brass Co.	Cu 95.60; Pb 0.40; Si 3.00; Mn 1.00	Rods—Screw machine products.
Calsun Bronze, 951 American Brass Co.	Cu 95.50; Sn 2.00; Al 2.50	Wire, rods, bars—Wire & cable for electrical conductors.
Aluminum Bronze, 5% Revere Copper & Brass Inc.	Cu 95.00; Al 5.00	Tubes—Condenser tubes.
Ambraloy, 901 (Aluminum Bronze, 5%) American Brass Co.	Cu 95.00; Al 5.00	Tubes, rods, bars, sheets, strip, plates, wire—Condenser & heat exchanger tubes, foreign coinage, architectural decoration to imitate gold.
Ambronze, 474 American Brass Co.	Cu 94.97; Zn 4.00; Sn 1.00; P 0.03	Sheets, strip, plates, wire—Electrical switch parts & spools.
Brazing Bronze, 222 Olin Mathieson Chemical Corp.	Cu 93.00; Zn 4.70; Fe 2.30	Sheets, strip—Retains fine grain size up to about 1600-1700° F. Used for furnace brazing, electrical applications such as circuit breaker arms, terminals.
Tin Brass, 2% Scovill Mfg. Co.	Cu 92.00; Sn 2.00; Zn 6.00	Electrical & radio springs & contacts.
Trembronze (Tin Brass) Miller Co.	Cu 92.00; Sn 2.00; Zn 6.00	Strip—General spring & contact applications in electrical & hardware fields.
NEB-Bronze, 2% New England Brass Co.	Cu 92.00; Sn 2.00; Zn 6.00	Strip—Springs, switch parts for electrical & hardware fields.
Ambraloy, 928 (Aluminum Bronze, 8%) American Brass Co.	Cu 92.00; Al 8.00	Sheets, strip, plates, wire, rods, bars—Valve stems, coins, medallions, plaques.
Panda QT Bronze Plume & Atwood Mfg. Co.	Cu 91.50; Sn 2.25; Zn 6.25	Strip—Spring & contact applications. Used where the extreme fatigue life of the higher tin bronzes is not required.
Aluminum Bronze, 7% Revere Copper & Brass Inc.	Cu 91.00; Al 7.00; Fe 2.00	Sheets, plates—Tanks, process equipment.
Aluminum Silicon Bronze Revere Copper & Brass Inc.	Cu 91.00; Al 7.00; Si 2.00	Rods, forgings—Bolts, nuts, gears, pinions, valve bushings, bodies & stems.
Silicon Aluminum Bronze Chase Brass & Copper Co.	Cu 91.00; Si 1.75; Al 7.25	Rods—Valve stems, fasteners.
Aluminum Silicon Bronze, 802 Mueller Brass Co.	Cu 91.00; Al 7.00; Si 2.00	Rods, die-pressed forgings—Screw machine parts, pole line hardware, valve stems, aircraft parts.
Duronze, 707 (Aluminum Silicon Bronze) Bridgeport Brass Co.	Cu 91.00; Al 7.00; Si 2.00	Rods, bars—Valve stems & parts, wire cable connector parts, bolts & nuts, hot forged parts, marine hardware, gears, pinions. Good corrosion resistance.
Everdur, 1014 (Aluminum Silicon Bronze) American Brass Co.	Cu 90.75; Al 7.25; Si 2.00	Rods—Screw machine parts, die-pressed forgings.
Ampco Grade 8 (Aluminum Bronze D) Ampco Metal Inc.	Cu 90.75; Al 6.50; Fe 2.25; Sn 0.25	Sheets, plates, extruded rods, tubes, pipe, shapes—Mechanical & processing fabrications, conveyors, liners, heads, slides, gibs & wear strips.
High Strength Commercial Bronze, 286 American Brass Co.	Cu 90.25; Zn 6.90; Pb 1.75; P 0.10; Ni 1.00	Rods, bars, tubes—Pole line hardware & other parts subject to outdoor exposure.
Nickel Leaded Commercial Bronze Chase Brass & Copper Co.	Cu 90.25; Zn 6.90; Ni 1.00; P 0.10; Pb 1.75	Rods—Machined nuts, screw machine parts.
Tin Brass, 1% Scovill Mfg. Co.	Cu 90.00; Sn 1.00; Zn 9.00	Strip—Special springs, contacts, jewelry, sockets.
Tin Brass, 0.5% Scovill Mfg. Co.	Cu 90.00; Sn 0.50; Zn 9.50	Strip—Jewelry, bearings, sockets, clips, weather strip.
Lubaloy, X80 (Tin Brass) Olin Mathieson Chemical Corp.	Cu 90.00; Zn 8.25; Sn 1.75	Sheets, strip—Radio tube socket contacts, fuse clips, contact springs, lock washers, solderless connectors, jewelry, coins, electric fan blades, medallions.
Lubaloy, 84 (Tin Brass) Olin Mathieson Chemical Corp.	Cu 90.00; Zn 9.50; Sn 0.50	Sheets, strip—Bearing alloy for bushings, bearings, clutch plates, thrust washers, jewelry, bezels, weather strip.

Name & Producer	Nominal Composition	Forms & Applications
NEB-Bronze, 17 New England Brass Co.	Cu 90.00; Sn 1.00; Zn 9.00	Strip—Springs, switch parts for electrical & hardware fields.
Free-Cutting Commercial Bronze, 96 Titan Metal Mfg. Co.	Cu 90.00; Pb 2.00; Ni 1.00; P 0.10; Zn 6.90	Rods—Screw machine parts where resistance to dezincification is an important consideration.
Scovill, 215 Scovill Mfg. Co.	Cu 90.00; Pb 2.00; Zn 8.00	Rods—High conductivity bronze.
Leaded Bearing Bronze, 116 Olin Mathieson Chemical Corp.	Cu 89.25; Zn 2.75; Sn 4.00; Pb 4.00	Sheets, strip—Bearings & bushings in automobiles, aircraft.
Avialite, 915 American Brass Co.	Cu 89.25; Sn 0.40; Al 9.25; Ni 0.50; Fe 0.60	Rods, bars, die-pressed forgings—Pickling crates. Used where strength & resistance to corrosion at high temperatures is required as in parts for internal combustion engines.
Contact Bronze, 92 (Tin Brass) Bridgeport Brass Co.	Cu 89.00; Sn 1.80; Zn 8.20	Strip—Electrical & radio spring applications.
Superloy (Tin Brass) Phelps Dodge Copper Products Corp.	Cu 88.00; Sn 2.00; Zn 10.00	Tubes—Condensers & heat exchangers.
Ambronze, 421 (Tin Brass) American Brass Co.	Cu 88.00; Sn 2.00; Zn 10.00	Tubes—Condensers & heat exchangers.
Brinco Bronze Bridgeport Rolling Mills Co.	Cu 88.00; Sn 2.00; Zn 10.00	Strip—Cold workable alloy characterized by its toughness, ductility, spring quality, high tensile strength, & high electrical conductivity; used in hardware & electrical fields.
Spring Bronze Scovill Mfg. Co.	Cu 87.00; Sn 2.00; Zn 11.00	Strip, tubes—Springs, condenser tubes.
Ampco Grade 15 (Aluminum Bronze) Ampco Metal Inc.	Cu 87.00; Al 9.50; Fe 3.20	Extruded solid & hollow rounds, shapes—Gears, small worm wheels, bushings, valve seats, guides.
Aluminum Bronze Olin Mathieson Chemical Corp.	Cu 87.00; Zn 7.00; Al 4.00; Fe 2.00	Sheets, strip—Bearings, bushings, thrust washers.
Brmcolloy, 300 Bridgeport Rolling Mills Co.	Cu 86.00; Sn 2.00; Zn 12.00	Strip—High fatigue resistance for electrical contacts, springs, relay parts.
Brmcolloy, 200 Bridgeport Rolling Mills Co.	Cu 86.00; Sn 1.00; Zn 13.00	Strip—Sash chain, electrical contacts, switch parts & fuse clips.
Brmcolloy, 100 Bridgeport Rolling Mills Co.	Cu 86.00; Sn 0.50; Zn 13.50	Strip—Jewelry chain, switch & relay components.
Ampco Grade 18 (Aluminum Bronze) Ampco Metal Inc.	Cu 85.50; Al 10.50; Fe 3.50	Extruded solid & hollow rounds, shapes—Bushings, bearings, worms & worm wheels, valve seats & guides, hydraulic valve parts, plungers, pump rods, guide-pin bushings, gibs, slides.
Manganese Red Brass, 507 American Brass Co.	Cu 85.00; Zn 14.00; Mn 1.00	Sheets, strip, plates—Electrical resistance welding.
Glo-Ray New England Brass Co.	Cu 85.00; Sn 0.50; Zn 14.50	Strip—Jewelry & allied fields. Used when color & strength are factors.
Silicon Red Brass, 1027 American Brass Co.	Cu 82.00; Zn 17.00; Si 1.00	Sheets, strip, plates, wire—Electrical resistance welding.
Ambraloy, 917 American Brass Co.	Cu 82.00; Al 9.50; Mn 1.00; Ni 5.00; Fe 2.50	Plates, rods, bars, die-pressed forgings—Tube sheets for heat exchangers.
Manganese Red Brass Bridgeport Brass Co.	Cu 81.00; Mn 1.25; Zn 17.75	Strip—Spot & seam welding.
High-Silicon Brass Titan Metal Mfg. Co.	Cu 81.00; Si 4.00; Zn 15.00	Rods, die castings, forgings—Valve parts, pole line hardware.
Silicon Brass Revere Copper & Brass Inc.	Cu 81.00; Si 4.00; Zn 15.00	Rods—Valve parts.
Ampcoloy, 45 (Nickel Aluminum Bronze) Ampco Metal Inc.	Cu 81.00; Al 10.20; Fe 2.70; Ni 5.00; Mn 1.00	Rods, bars, shapes, hollow bars, forgings, castings—Valve guides, gears, shafting, propellers, bushings, tube sheets.
Manganese Cartridge Brass Bridgeport Brass Co.	Cu 70.00; Mn 1.25; Zn 28.75	Strip—Fabricates as well as 70-30 brass. Good for spot & seam welding.
Manganese Brass Revere Copper & Brass Inc.	Cu 70.00; Mg 1.25; Zn 28.75	Strip—Used for parts requiring spot & seam welding.
Manganese Brass, 277 Olin Mathieson Chemical Corp.	Cu 70.00; Zn 28.90; Mn 1.10	Sheets, strip—Same physical characteristics as cartridge brass except for lower electrical conductivity, permitting easier spot & seam welding.
Manganese Bronze, 112 (Grade B) Titan Metal Mfg. Co.	Cu 64.00; Mn 4.00; Al 3.00; Fe 3.00; Zn 26.00	Rods, forgings—High strength, toughness & hardness. Used for work gears, valve parts.
Nittany, 31 (Leaded Brass) Titan Metal Mfg. Co.	Cu 62.00; Pb 1.70; Si 36.30	Rods—Screw machine products requiring assembly operations such as staking, turning over, etc.
Thread Rolling-Free Cutting Brass, 212 Mueller Brass Co.	Cu 61.00; Pb 1.75; Zn 37.25	Rods—Screw machine products.
Nonleaded Bearing Alloy, 601 Mueller Brass Co.	Cu 61.00; Mn 2.50; Si 1.00; Zn 35.50	Rods—Screw machine products.
Medium-Leaded Bearing Alloy, 602 Mueller Brass Co.	Cu 61.00; Mn 2.50; Si 1.00; Pb 1.00; Zn 34.50	Rods—Screw machine products, shaft bushings.
High-Leaded Bearing Alloy, 604 Mueller Brass Co.	Cu 61.00; Mn 2.50; Si 1.00; Pb 2.50; Zn 33.00	Rods—Screw machine products.
Low-Leaded Bearing Alloy, 605 Mueller Brass Co.	Cu 61.00; Mn 2.50; Si 1.00; Pb 0.50; Zn 35.00	Rods—Screw machine products, hydraulic pump connecting rod retainers.
Medium-Leaded Forgeable Bearing Alloy, 603 Mueller Brass Co.	Cu 60.00; Mn 2.50; Si 1.00; Pb 1.00; Zn 35.50	Forgings—Hydraulic transmission gears, hydraulic pump cylinder barrels.
Free-Cutting Manganese Bronze (A) Leaded Titan Metal Mfg. Co.	Cu 59.00; Pb 0.70; Sn 0.90; Fe 0.90; Mn 0.20; Zn 38.30	Rods, forgings—Valve parts, marine hardware.
Free-Cutting Manganese Bronze (A) Leaded, 241A Mueller Brass Co.	Cu 59.00; Pb 0.70; Sn 0.90; Fe 0.90; Mn 0.20; Zn 38.30	Rods, forgings—Screw machine products, valve parts, aircraft parts.
Forgeable Bearing Alloy, 600 Mueller Brass Co.	Cu 58.00; Mn 2.50; Si 0.75; Al 1.50; Zn 37.25	Forgings, rods—Screw machine products, chain saw clutch bearings, automotive transmission synchronizing rings, pyrometer bearings, squirrel cage feed fingers, hydraulic pump driving cams, lead screw nuts.
Tinicosil, 54 (Extruded Leaded Nickel Silver) Titan Metal Mfg. Co.	Cu 47.00; Ni 10.00; Pb 2.25; Mn 2.00; Zn 38.75	Round & hexagon rods—Screw machine products, instrument parts, fishing tackle, valve & plumbing parts.
Tinicosil, 53 (Extruded Nickel Silver) Titan Metal Mfg. Co.	Cu 46.00; Ni 10.00; Zn 44.00	Forgings—Plumbing, valves, instrument parts.

HIGH TEMPERATURE ALLOYS

Alloy	Composition C	Mn	Si	Cr	Ni	Co	Mo	W	Cb	Ti	Al	Fe	Others	Properties & Applications
TYPE: FERRITIC LOW ALLOYS & STAINLESS ALLOYS														
422 (Crucible)	0.22	0.65	0.36	12.00	0.70	....	1.00	1.00	....	....	....	Bal	V 0.25)	
422-M	0.28	0.84	0.25	12.00	0.20	....	2.25	1.70	....	....	....	Bal	V 0.50)	
H-46 (British)	0.15	0.57	0.40	11.50	....	....	0.45	....	0.25	....	....	Bal	V 0.30)	Alloys are higher strength modifications of AISI standard 12% chromium, Type 403 stainless. Various grades are used for steam & gas turbine buckets, compressor blades, discs & bolts. Outstanding resistance to stress-corrosion cracking & oxidation. Available in sheets for supersonic aircraft application.
Rex-448 (British)	0.15	....	....	11.50	....	....	0.75	....	0.45	....	....	Bal	V 0.15)	
Uniloy 1409 Cb	0.16	....	....	12.75	....	....	....	....	0.42	....	....	Bal	.....)	
Greek Ascoloy	0.15	..	....	13.00	2.00	....	....	3.00	....	....	....	Bal	.....)	
Moly Ascoloy	0.08	....	....	13.00	....	....	2.00	....	....	....	....	....	.....)	
Lapelloy	0.30	....	....	11.50	0.35	....	2.75	....	....	....	....	Bal	V 0.25)	
Uniloy 1430 W	0.30	....	....	12.25	....	....	....	....	....	....	....	Bal	.....)	
Uniloy 1422 MV	0.23	....	....	11.75	....	....	1.25	....	....	....	....	Bal	V 0.22)	
H-40 (British)	0.23	0.30	0.45	2.70	....	....	....	....	....	....	....	Bal	.....	Gas turbine rotors, casings, castings & other uses needing high creep strength up to 600° F.
Croloy ½	0.20*	0.50	0.20	0.70	....	....	0.50	....	....	....	....	....	.....	950° F)
Croloy 1	0.15*	0.50	0.50	1.00	....	....	0.50	....	....	....	....	....	.....	1000° F)
Croloy 1¼	0.15*	0.50	0.75	1.25	....	....	0.50	....	....	....	....	....	.....	1100° F) Superheater tubing & pipe with temperature
Croloy 2	0.15*	0.50	0.50	2.00	....	....	0.50	....	....	....	....	....	.....	1100° F) limits shown at left. Also used for oil
Croloy 2¼	0.15*	0.50	0.50	2.25	....	....	1.00	....	....	....	....	....	.....	1100° F) refinery tubing. Croloy alloys are produced
Croloy 3M	0.15*	0.50	0.50	3.00	....	....	0.90	....	....	....	....	....	.....	1125° F) by Babcock & Wilcox. These compositions
Croloy 5	0.15*	0.50	0.50	5.00	....	....	0.50	....	....	....	....	....	.....	1150° F) are available from other producers under
Croloy 5 Ti	0.12*	0.50	0.50	5.00	....	....	0.50	....	....	(Ti 4 x C – 0.70 max)		....	.....	1150° F) different tradenames.
Croloy 5 Si	0.15*	0.50	1.50	5.00	....	....	0.50	....	....	....	....	....	.....	1150° F)
Croloy 7	0.15*	0.50	0.50	7.00	....	....	0.50	....	....	....	....	....	.....	1150° F)
Croloy 9M	0.15*	0.50	0.50	9.00	....	....	1.00	....	....	....	....	....	.....	1200° F)
Chromalloy	0.20	....	....	1.00	....	....	1.00	....	....	....	....	Bal	V 0.12	Sheet metal casing on aviation gas turbines.
Uniloy 14 HV	0.45	....	....	1.00	....	....	0.55	....	....	....	....	Bal	V 0.30	Same as above & steam & gas turbine bolting.
17-22 A	0.41	....	0.65	1.25	....	....	0.50	....	....	....	....	Bal	V 0.25	Same as above.
17-22 AS	0.30	....	0.65	1.25	....	....	0.50	....	....	....	....	Bal	V 0.25	Steam & gas turbine bolting up to 1050° F; sheet metal casing assemblies. Axial-flow compressor blading at 800° F. Aircraft brakes. Compressor discs.
17-22 AV	0.30	....	0.65	1.25	....	....	0.50	....	....	....	....	Bal	V 0.85	Higher vanadium modification of above.
Thermold A (Universal-Cyclops)	0.35	0.45	1.00	5.00	....	....	1.40	....	....	....	....	....	V 0.45	Ultrahigh strength for service up to 1000° F. Airframes, skin, fasteners, rivets, axles, rotors.
Thermold B	0.35	0.45	1.00	5.00	....	....	1.70	1.35	....	....	....	....	.....	Same as above for ultrahigh strength at 1000° F.
Thermold J	0.53	0.35	1.00	5.00	1.50	....	1.75	....	....	....	....	....	V 1.00	Ultrahigh strength up to 1000° F. Tensile strength 230,000 psi at 1000° F; 75,000 psi at 1200° F.
Peerless 56 (Crucible)	0.40	0.55	1.00	3.25	....	....	2.50	....	....	....	....	....	V 0.33	Bars, wire, sheets, plates, and billets for reforging. Tensile strength 228,000 psi at 1000° F, 154,000 psi at 1100° F.
Holcomb 218 (Crucible)	0.35	0.35	1.00	5.00	....	....	1.40	....	....	....	....	....	V 0.45	Aircraft sheets, forgings & fittings for high strength & resistance to softening up to 1000° F.
Nu-Die V (Crucible)	0.40	....	1.05	5.00	....	....	1.35	....	....	....	....	....	V 1.10	Bars, wire, sheets & billets for reforging.
Cro-Mow (Crucible)	0.32	0.35	1.00	5.00	....	....	1.35	1.35	....	....	....	....	V 0.20	Same as Holcomb 218.
HTB-1	1.02	0.35	0.40	1.45	....	....	....	....	....	....	....	1.00	Al 1.0	Aircraft sheet forgings & fittings for high strength & resistance to softening to 1000° F.
HTB-2	0.58	0.30	0.15	4.75	....	....	5.25	....	....	....	....	....	V 0.55)	(Used in high temperature bearing applications, primarily
HTB-3	0.57	0.30	1.15	4.75	....	....	5.25	....	....	....	....	....	V 0.55)	(jet engines.
Teton	1.00	....	....	1.50	....	....	....	....	....	....	....	....	.....)	(Aircraft sheets, forgings & fittings for high strength &
Potomac A	0.40	0.30	0.90	5.00	....	....	1.30	....	....	....	....	....	V 0.50)	(resistance to softening up to 1000° F. Allegheny Ludlum
Potomac M	0.40	....	1.00	5.00	....	....	1.00	....	....	....	....	....	V 1.00)	(alloys.
HWD #1 (Firth Sterling)	0.35	....	1.00	5.00	....	....	1.55	1.40	....	....	....	....	V 0.30)	High temperature applications under 1000° F. Used mainly for structural parts requiring high strength & shock resistance.
HWD #2	0.37	....	1.00	5.25	....	....	1.35	....	....	....	....	....	V 0.50)	
HWD #3	0.40	....	1.00	5.25	....	....	1.25	....	....	....	....	....	V 1.00)	
TBS-600	0.95–1.10	0.60–0.80	0.85–1.25	1.25–1.65	....	....	0.25–0.35	....	....	....	....	....	P 0.025 max S 0.025 max	For high hardness & wear resistance to 600° F; ball & roller bearings.
CBS-600	0.16–0.22	0.50–0.70	0.90–1.25	1.25–1.65	....	....	0.90–1.10	....	....	....	....	....	P 0.040 max S 0.040 max	For high hardness & wear resistance to 600° F; ball & roller bearings.
Vascojet 1000 (Vanadium-Alloys)	0.40	0.30	0.90	5.00	....	....	1.30	....	....	....	....	Bal	V 0.50	Ultrahigh strength for service up to 1000° F; airframes, skin, fasteners, rivets, axles, rotors, spindles, etc.
Vasco X-4 (Vanadium-Alloys)	0.40	0.30	0.30	4.25	....	4.25	0.40	4.25	....	....	....	Bal	V 2.10)	
Vasco X-8 (Vanadium-Alloys)	0.47	0.30	0.90	7.75	....	....	1.35	....	....	....	....	Bal	V 1.40)	
Vasco X-21 (Vanadium-Alloys)	0.33	0.20	0.30	3.50	....	....	....	9.75	....	....	....	Bal	V 0.45)	Ultrahigh strength material.
Vasco Y-9 (Vanadium-Alloys)	0.48	0.30	0.90	3.25	....	....	1.45	....	....	....	....	Bal	V 0.25)	
Lapelloy C	0.20	0.65–1.00	0.50*	11.00–12.00	0.50*	....	2.50–3.00	....	....	....	....	P 0.03* S 0.03* Cu 1.75–2.25 N 0.06–0.10		Similar to Lapelloy, but with greater ductility & impact strength.

Alloy	Composition C	Mn	Si	Cr	Ni	Co	Mo	W	Cb	Ti	Al	Fe	Others	Properties & Applications
V.S.M.	0.70	0.50	1.10	3.00	....	....	5.25	....	....	....	....	...	.....	Resistant to wear & abrasion at high temperatures. For valve seat inserts, stems, slides, guides & bearings.
636 Alloy	0.20–0.25	1.00*	1.00*	12.00–14.00	0.50–1.00	....	0.75–1.25	0.75–1.25	....	....	....	P 0.04*, S 0.03*, V 0.20–0.50		Buckets & blades in steam turbines; aircraft valves.
No. 709 #1	0.30	0.55	0.65	1.25	....	....	0.50	....	....	....	....	....	P 0.025*) S 0.025*) V 0.25)	Use in aircraft, steam turbines, valves, pressure vessels; jet engine components.
No. 709 #2	0.45	0.55	0.25	1.00	....	....	0.55	....	....	....	....	....	P 0.025*) S 0.025*) V 0.30)	
H11 Firedie (Columbia)	0.38	0.35	1.00	5.25	....	....	1.35	....	....	....	....	Bal	V 0.50	Bars, hot rolled & hammer forged; blocks, discs & ring forgings.
H12 Alcodie (Columbia)	0.35	0.35	1.00	5.00	....	....	1.45	1.25	....	....	....	Bal	V 0.45	Same as H11 Firedie.
H13 Vanadium Firedie (Columbia)	0.38	0.35	1.00	5.25	....	....	1.35	....	....	....	....	Bal	V 1.00	Same as H11 Firedie.
H21 Formite #2 (Columbia)	0.33	0.30	....	3.25	....	....	....	9.50	....	....	....	Bal	V 0.50	Same as H11 Firedie.
H24 Formite #3 (Columbia)	0.50	0.30	....	3.25	....	....	....	15.50	....	....	....	Bal	V 0.50	Same as H11 Firedie.
H26 Clarite HW (Columbia)	0.58	0.25	....	4.00	....	....	....	18.00	....	....	....	Bal	V 0.70	Same as H11 Firedie.
H43 Molite HW10 (Columbia)	0.63	0.25	....	4.00	....	....	8.25	....	....	....	....	Bal	V 2.00	Same as H11 Firedie.
Acmite L (Columbia)	0.50	0.25	....	4.00	....	5.00	....	18.00	....	....	....	Bal	V 1.10	Same as H11 Firedie.
Cobite L (Columbia)	0.49	0.30	....	4.25	....	8.75	....	18.50	....	....	....	Bal	V 1.90	Same as H11 Firedie.
G-192	0.60	8.50	....	22.00	....	....	....	....	....	....	....	Bal	N 0.35)	Nickel-free austenitic grades being developed by Allegheny
AF-183	0.30	18.00	....	12.00	....	....	3.00	....	....	....	....	....	(V 0.75; N 0.20)	Ludlum Steel Corp. for parts requiring high strength at
AF-71	0.30	18.00	....	12.00	....	....	3.00	....	....	....	....	(V 0.75; N 0.30, B 0.20)		elevated temperatures.
TYPE: CHROMIUM-NICKEL-IRON ALLOYS														
19-9DL	0.30	1.10	0.60	19.00	9.00	....	1.25	1.20	0.40	0.30	....	66.00	....	Jet engine, gas turbine & turbocharger buckets, bolts, rotors & sheet metal assemblies. Bolting & valve trim for refineries, boilers & steam turbines.
19-9DX	0.30	1.00	0.55	19.20	9.00	....	1.50	1.20	....	0.55	....	66.00	....	Cb-free version of above.
19-9WX	0.11	....	....	20.50	8.50	....	0.50	1.50	1.30	0.20	....	....	.....	Welding wire.
Inco "425"	0.04	1.30	0.75	5.50	25.50	....	....	....	....	2.40	0.65	63.80	.....	Nonmagnetic retainer rings for central station generators; age hardenable.
Incoloy "901"	0.04	0.45	0.30	13.50	43.25	....	5.90	....	....	2.50	....	37.35	.....	Aircraft industrial gas turbines; wheels (discs) & components with high strength at 1000-1400° F; bolting. Age hardenable.
Incoloy	0.04	0.75	0.35	20.50	32.50	....	....	....	....	....	....	45.50	.....	Resistance to oxidation up to 1900° F. Similar to Inconel, but with improved resistance to attack by sulfur, green rot, molten cyanide salts; petrochemical equipment, heat treating fixtures.
Incoloy-T	0.04	0.75	0.35	20.50	32.50	....	....	....	....	1.00	....	44.50	.....	Slightly better elevated temperature properties. Welded sheet metal components.
Croloy 15-15N	0.15*	2.00*	0.75*	16.00	15.00	....	1.55	1.40	1.05	....	....	Bal	N 0.15*	Superheater tubing, steam piping.
17-14 Cu-Mo	0.12	0.75	0.50	15.90	14.10	....	2.50	....	0.45	0.25	....	Bal	Cu 3.00	High strength austenitic stainless steel for service up to 1500° F. Aircraft gas turbines, boilers, etc.
Timken 16-25-6	0.08*	1.35	0.70	16.00	25.00	....	6.00	....	....	....	....	50.00	N 0.15	Jet engine, gas turbine & turbosupercharger wheels & buckets. Bolting & sheet metal. Resists sea water. Pickle chains.
Timken 16-15-6	0.07*	7.50	0.50	16.00	15.00	....	6.00	....	....	....	....	55.00	N 0.35	High temperature applications similar to above.
Discaloy 24	0.03	0.64	0.92	13.10	25.50	....	2.83	....	....	1.83	0.16	Bal	.....	Turbine wheels, structural members & fasteners in jet engine & gas turbine applications.
Croloy 16-8-2	0.10	1.50	0.50	15.00	8.00	....	1.50	....	....	....	....	Bal	.....	Welding wire for TP 316 and TP 347 steels.
A-286	0.05	1.35	0.95	15.00	26.00	....	1.75	....	....	2.00	0.20	Bal	V 0.30	Jet engine & gas turbine buckets, bolts, discs. High strength, nonmagnetic.
EME	0.10	0.50	0.70	19.00	12.00	....	....	3.20	1.20	....	....	63.00	N 0.15	Steam turbine bolting & valve stems.
Thermenol	....	....	....	....	....	....	1.70	....	....	....	16.00	Bal	V 0.30	Oxidation resistant sheet metal parts.
NA-22H (Cast) (Blaw-Knox)	0.50	1.30	1.00	27.00	48.00	....	....	6.00	....	....	....	Bal	.....	Strength & oxidation resistance for use at 2200° F. Furnace muffles, fans, retorts, annealing & radiant tubes, baffle support bars, etc.
HNM (Crucible)	0.30	3.50	....	18.50	9.50	....	....	....	....	....	....	Bal	P 0.20	Aircraft sheet & bar applications. Compressor blades & sheets for turbine engines; nonmagnetic.
HTX (Crucible)	0.45	8.50	....	21.00	8.50	....	1.50	....	....	....	....	Bal	P 0.25	Turbine wheels, high temperature sheets for aircraft.
Cast HTX	0.45	8.00	0.50	21.00	8.00	....	1.50	....	....	....	....	Bal	P 0.22 N 0.20	High strength & rupture properties up to 1600° F.
D979	0.01	....	....	14.00	45.00	....	4.00	4.00	....	4.00	1.00	Bal	B 0.01	Highly stressed jet engine parts up to 1600° F. Has good workability.
22-4-9 (Armco)	0.45–0.60	7.00–10.00	1.00*	20.00–23.00	3.00–5.00	....	....	....	....	....	....	Bal	N 0.30–0.50	Austenitic, nonmagnetic alloy with high strength & hardness up to 1600° F with good scaling resistance. Steam valves & gas turbine parts, nonmagnetic roller bearings & balls.

(Continued on page S-14)

HIGH-TEMPERATURE ALLOYS (continued)

Alloy	Composition C	Mn	Si	Cr	Ni	Co	Mo	W	Cb	Ti	Al	Fe	Others	Properties & Applications
Gaman-H (Crucible)	0.65	12.00	....	25.00	....	....	....	....	....	....	....	....	N 0.40	Stretch & oxidation resistance for use at 2100° F. Furnace rider sheets & combustion chambers.
17-7 PH	0.09*	1.00*	1.00*	16.00–18.00	6.50–7.75	....	....	....	....	....	0.75–1.50	Bal	....	Hardenable by low temperature heat treatment to 180,000 psi min UTS & 150,000 psi min YS. Airframes, missiles, powerplants, etc., up to 900° F.
17-4 PH	0.07*	1.00*	1.00*	15.50–17.50	3.00–5.00	....	....	....	0.15–0.45 (Cb + Ta)	....	....	Bal	Cu 3.00–5.00	High strength, corrosion resistant & no distortion by low temperature treatment. Valves, shafts, compressor blading, gears, bolting & structural parts.
PH 15-7 Mo (Armco)	0.09*	1.00*	1.00*	14.00–16.00	6.50–7.50	....	2.00–3.00	....	....	....	0.75–1.50	Bal	....	Hardenable by low temperature treatment to 225,000 min UTS & 200,000 psi min YS. For aircraft and missile use up to 1000° F.
AM-350	0.12	1.00	0.50	16.50	4.50	....	2.60	....	....	....	....	Bal	N 0.10	(Sheet applications, compressor blades. Structural applications in airframes, missiles up to 1000° F. Combines ease
AM-355	0.12	1.00	0.50*	15.50	4.50	....	2.75	....	....	....	....	Bal	N 0.10	(of 300 series fabrication with heat treatment properties (of 400 grade stainless.
Multimet Alloy N-155 (Wrought)	0.16*	1.50	1.00*	21.00	20.00	20.00	3.00	2.50	....	....	....	Bal	N 0.20* Cb + Ta 1.25*	Good oxidation & corrosion resistance up to 2000° F.
(Cast)	0.20*	1.50	1.00*	21.00	20.00	20.00	3.00	2.50	....	....	....	Bal	N 0.20* Cb + Ta 1.25*	Used where good ductility is a prime factor. Jet engine tail pipes, afterburners & nozzle assemblies.
S-590	0.40	1.50	0.70	20.00	20.00	20.00	4.00	4.00	4.00	....	....	24.00	.....	Wheels & buckets in stationary gas turbines.
Refractaloy 26	0.03	0.80	1.00	18.00	38.00	20.00	3.20	....	....	2.60	0.20	Bal	....	Superior strength at temperatures above 1250° F. Low magnetic response, good corrosion resistance. Buckets, bolts, coiled & flat springs, turbine discs.
Refractaloy 70	0.04	2.00	0.30	20.00	21.00	30.00	8.00	4.20	....	....	....	Bal	.....	Gas turbine blades & nozzle vanes. Flat & coiled springs. High endurance limit at 1200° F.
Refractaloy 80	0.10	0.60	0.70	20.00	20.00	30.00	10.00	5.00	....	....	....	Bal	.....	Used extensively for creep testing holders. High strength above 1300° F.
K42B	0.03	0.70	0.70	18.00	42.00	22.00	....	....	....	2.10	0.20	Bal	.....	High resistance to heat & corrosion. Low creep up to 1350° F. Gas & steam turbine blades, bolts.
TYPE: NICKEL-BASE ALLOYS														
Inconel	0.01	0.35	0.20	15.50	76.00	....	....	....	....	....	....	7.00	.....	Resists oxidation up to 2200° F, carburizing & nitriding atmospheres & corrosion. Manifolds, combustion liners, domes, transition liners.
Inconel "702"	0.04	0.10	0.25	15.50	79.00	....	....	....	....	....	3.00	0.50	.....	Welded aero sheet metal components; exceptional resistance to oxidation over 1800° F.
Nimonic "75"	0.08–0.15	1.00*	1.00*	18.00–21.00	Bal	....	....	....	....	0.20–0.60	....	5.00*		Similar to Inconel. Flame tubes, afterburners.
Inconel "M"	0.03	2.25	0.10	16.00	71.50	....	....	....	....	3.00	0.05	7.00		Age-hardenable Inconel. High strength & resistance to oxidation & leaded fuels. Valves for aviation piston type engines.
Inconel "X"	0.04	0.70	0.30	15.00	73.00	....	....	....	0.90	2.50	0.90	7.00		Age-hardenable Inconel. Oxidation resistance, high strength up to 1500° F. Blades, rotors, bolting, welded sheet metal components.
Inconel "X," Type "550"	0.04	0.70	0.40	15.00	73.00	....	....	....	0.90	2.40	0.90	7.00	.....	Inconel "X" with increased hardener, turbine blades.
Nimonic "80A"	0.10*	0.10*	1.00*	18.00–21.00	Bal	2.00*	....	....	....	1.80–2.70	0.50–1.80	5.00*	.....	Rotor turbine blades—up to 1400° F, stator blades.
Nimonic "90"	0.10*	1.00*	1.50*	18.00–21.00	Bal	15.00–21.00	....	....	....	1.80–3.00	0.80–2.00	5.00*	.....	Rotor turbine blades—up to 1550° F.
Inconel "700"	0.13	0.08	0.25	15.00	46.00	29.00	3.90	....	....	2.29	3.20	0.80	.....	Rotor turbine blades—up to 1650° F.
Hastelloy Alloy B (Wrought)	0.05*	1.00*	1.00*	1.00*	Bal	2.50*	28.00	....	....	....	....	5.50	V 0.40*	Outstanding resistance to hot hydrochloric acid, wet hydrogen chloride gas & other reducing agents. Oxidation rate in air is low enough for use up to 1400° F.
(Cast)	0.12*	1.00*	1.00*	1.00*	Bal	2.50*	28.00	....	....	....	....	5.50	V 0.60*	
Hastelloy Alloy C (Wrought)	0.08*	1.00*	1.00*	15.50	Bal	2.50*	16.00	3.75	....	....	....	5.50	V 0.35*	Good all around high-temperature properties. Particularly for parts highly stressed or subjected to repeated thermal shock at 1600-1800° F. Withstands strong oxidizing conditions, sea water & acetic, formic, phosphoric, sulfurous & sulfuric acids.
(Cast)	0.12*	1.00*	1.00*	16.50	Bal	2.50*	17.00	4.50	....	....	....	5.50	V 0.40*	
Hastelloy Alloy R-235 (Wrought)	0.16*	1.00*	1.00*	15.00	Bal	2.50*	5.00	....	....	2.50	2.00	10.00	.....	Vacuum melted, precipitation hardening alloy with excellent strength up to 1750° F.
GMR-235 (Cast)	0.20*	0.25*	0.60*	15.50	Bal	....	5.25	....	....	2.00	3.00	10.00	B 0.07*	Has excellent stress-rupture properties at high stresses up to 1700° F. Vacuum melted.
GMR-235D (Cast)	0.20*	0.10*	0.30*	15.50	Bal	....	5.25	....	....	2.50	3.60	4.25	B 0.10*	Investment cast, vacuum melted. Average rupture life 150 hrs, 1600° F, 28,000 psi. Applications same as GMR-235.
Incoloy "901"	0.05	0.50	0.35	13.00	40.00	....	6.00	....	....	2.50	0.20	Bal	.....	Matches mechanical properties of Inconel "X" at temperatures to 1350° F; turbine discs & parts where high tensile, creep & rupture strengths are needed in the 1000-1400° F range.
Inconel "713C" (Cast Alloy)	0.12	0.15	0.40	13.00	Bal	....	4.50	....	2.25	0.60	6.00	1.00	.....	Has high rupture strength to 1700° F & above, exceptional resistance to thermal fatigue, good castability; turbine blades in advanced engines.

Hastelloy Alloy X (Wrought)	0.15*	1.00*	1.00*	22.00	Bal	1.50	9.00	0.60	....	....	....	18.50	.....	Good scale resistance to 2200° F. Excellent for cast & fabricated heat treating equipment.
(Cast)	0.20*	1.00*	1.00*	22.00	Bal	1.50	9.00	0.60	....	....	....	18.50	.....	
Waspaloy	0.05	....	....	19.50	Bal	13.50	4.00	....	....	3.00	1.25	2.00*	.....	Gas turbine buckets. Largely vacuum melted.
Udimet 500	0.15*	0.75*	0.75*	20.00	Bal	13.00	4.00	....	....	3.00	2.75	4.00*	.....	Gas turbine components. High strength at elevated temperatures. Vacuum melted.
Thetalloy (Cast)	....	2.50	....	25.00	Bal	12.50	3.00	7.00	....	....	....	....	.....	Gas turbine diaphragms.
M-252 (GE)	0.10	1.00	0.70	19.00	54.00	10.00	10.00	....	....	2.50	0.75	2.00	.....	Gas turbine buckets, torque rings. Vacuum melted.
Illium G	0.25	0.35	0.90	22.00	58.50	....	6.00	....	....	....	....	6.00	Cu 6.00	High temperature & corrosion resistant applications.
Illium R	0.07	0.40	0.11	22.00	64.00	....	5.00	....	....	....	....	6.00	Cu 2.50	High temperature & corrosion resistant applications.

TYPE: COBALT-BASE ALLOYS

Haynes Stellite Alloy No. 21 (Cast)	0.30*	1.00*	1.00*	27.00	2.75	Bal	5.50	....	....	....	....	2.00*	.... ..	Resists oxidizing & reducing atmospheres up to 2100° F. Good high temperature strength, thermal shock resistant.
Haynes Stellite Alloy No. 30 (Cast)	0.50*	1.00*	1.00*	26.00	15.00	Bal	6.00	....	....	....	....	2.00*	.....	Excellent creep properties at 1600° F. Modulus of elasticity does not drop off rapidly & endurance properties are good.
Haynes Stellite Alloy No. 31 (Cast)	0.55*	1.00*	1.00*	25.50	10.50	Bal	....	7.50	....	....	....	2.00*	.....	Good endurance & creep properties. Stress-rupture strength 27,000 psi at 1500° F 100 hr.
Haynes Alloy No. 36 (Cast)	0.45*	1.50	1.00*	18.50	10.00	Bal	....	15.00	....	....	....	2.00*	B 0.05*	Cast modification of alloy No. 25. Excellent creep & rupture properties. Good ductility.
Haynes Alloy No. 25 (Wrought)	0.15*	1.50	1.00*	20.00	10.00	Bal	....	15.00	....	....	....	3.00*	.....	Exceptional high temperature strength. Good forming & welding characteristics. Used for nozzle partitions, afterburner assemblies.
WF-11 (Crucible)	0.15	1.50	0.50	20.00	10.00	Bal	....	15.00	....	....	....	3.00*	.....	Afterburner sheets, turbine rings, nozzle vanes in turbine engines—6000 psi for 100 hr at 1800° F.
J-1570	0.20	....	....	20.00	28.00	Bal	....	6.50	....	4.00	....	....	.....	Gas turbine buckets & high temperature sheet metal parts. Vacuum melted.
S-816	0.38	1.50	0.70	20.00	20.00	43.00	4.00	4.00	4.00	..	..	3.00	.....	Jet engine buckets. High temperature springs. Steam turbine bolting & buckets.
V-36	0.31	0.90	0.50	25.00	20.00	42.00	1.00	2.00	2.20	..	..	3.00	.....	Sheet uses; stressed high temperature parts. Low density.

TYPE: MOLYBDENUM-BASE ALLOYS

Unalloyed Mo	Electric and electronic parts; rocket nozzles; glass melting furnace parts.
0.3% Cb Alloy	Piercer points; experimental gas turbine buckets and guide vanes. Useful strength at temperatures above 1600° F greater than that of any other commercially available material. Must be protected against oxidation at elevated temperatures. Stress-relieved 0.5% Ti alloy has 100-hr stress-rupture strength of 66,000 psi at 1600° F; 53,000 psi at 1800° F and 34,000 psi at 2000° F.
0.5% Ti Alloy	
1.0% V Alloy	
2.0% W Alloy	Alloys shown are commercially available from Climax Molybdenum Co.

*Indicates maximum.
Note: This chart does not include the AISI grades of stainless and heat resistant steels, many of which are used in high temperature applications.

HIGH STRENGTH STEELS

Including High Strength, Low Alloy Steels

Name	Producer	Chemical Composition Limits, Per Cent C	Mn	P	S	Si	Cu	Mo	Cr	Ni	Others	Yield Point Min psi	Tensile Strength Min psi	% Elongation in 2-in. for Stand. ASTM Spec.
Cor-Ten	United States Steel Corp., Acme Steel Co., Algoma Steel Corp. Ltd., Crucible Steel Co. of America, Greer Steel Co., Inland Steel Co., Lukens Steel Co., Republic Steel Corp., Sharon Steel Corp.	0.12 max	0.20–0.50	0.07–0.15	0.05 max	0.25–0.75	0.25–0.55	.....	0.30–1.25	0.65 max	.....	50,000	70,000	22
Dynalloy	Alan Wood Steel Co.	0.15 max	0.60–1.00	0.05–0.10	0.05 max	0.30 max	0.30–0.60	0.05–0.15	.....	0.40–0.70	.....	50,000	70,000	25
Hi-Steel	Inland Steel Co.	0.12 max	0.50–0.90	0.05–0.12	0.05 max	0.15 max	0.95–1.30	0.08–0.18	..	0.45–0.75	Al 0.12–0.27	50,000	70,000	22 (1)
Hi-Man	Inland Steel Co.	0.25 max	1.10–1.60	0.045 max	0.05 max	0.30 max	0.20 min	..	..	..	.....	50,000	75,000	20
High Strength #1	Armco Steel Corp.	0.15 max	0.40–0.95	0.04–0.07	0.04 max	0.15 max	0.50–0.75	..	..	0.60–0.90	.....	50,000	70,000	22
High Strength #2	Armco Steel Corp.	0.15 max	0.40–0.95	0.04–0.07	0.04 max	0.15 max	0.50–0.75	.....	.....	0.60–0.90	.....	45,000	64,000	..
High Strength #3	Armco Steel Corp.	0.10 max	0.30–0.90	0.04 max	0.05 max	0.10 max	0.20 max	.....	.....	.....	V 0.02 min	40,000	60,000	35
High Strength #4	Armco Steel Corp.	0.25 max	1.10–1.60	0.045 min	0.05 max	0.15–0.35	0.20 min	..	..	..	.....	50,000	70,000	22
Jalten #1	Jones & Laughlin Steel Co.	0.15 max	1.30 max	0.04 max	0.05 max	0.10 max	0.30 min	.....	.....	.....	V 0.035–0.065	50,000	65,000	22
Jalten #2	Jones & Laughlin Steel Co.	0.15 max	1.40 max	0.14 max	0.05 max	0.10 max	0.30 min	.....	.....	.....	.....	50,000	70,000	22
Jalten #3	Jones & Laughlin Steel Co.	0.25 max	1.60 max	0.04 max	0.05 max	0.30 max	0.20 min	.....	.....	.....	.....	50,000	70,000	22
Kaisaloy #1	Kaiser Steel Corp.	0.20 max	1.25 max	0.05 max	0.05 max	0.60 max	0.35 max	0.15 max	0.25 max	0.50 max	V 0.02 min Ti 0.005 min Al 0.25 max	50,000	70,000	23
Kaisaloy #2	Kaiser Steel Corp.	0.12 max	0.60 max	0.04 max	0.04 max	0.50 max	0.30 max	0.10 max	0.25 max	0.60 max	V 0.02 min Ti 0.005 min	45,000	60,000	25

(Continued on page 16)

HIGH-STRENGTH STEELS (continued)

Name	Producer	C	Mn	P	S	Si	Cu	Mo	Cr	Ni	Others	Yield Point Min psi	Tensile Strength Min psi	% Elongation in 2-in. for Stand. ASTM Spec.
Kaisaloy #3	Kaiser Steel Corp.	0.35 max	1.50 max	0.04 max	0.05 max	0.35 max	0.35 max	0.10 max	0.25 max	0.40 max	V 0.05 min Ti 0.005 min	.....	.....	..
Kaiser Structural High Strength Steel	Kaiser Steel Corp.	0.27 max	1.60 max	0.045 max	0.05 max	0.30 max	0.20 max	.....	.....	.....	.....	50,000	75,000	18
Man-Ten	United States Steel Corp.	0.25 max	1.10–1.60	0.045 max	0.05 max	0.30 max	0.20 min	.....	.....	.....	.....	50,000	75,000	20
Maxeloy	Crucible	0.15 max	1.30 max	0.07 max	0.04 max	0.60–0.90	0.20 min	.....	.....	0.50 max	V 0.05 min	50,000	70,000	22
Mayari R	Bethlehem Steel Co.	0.12 max	0.50–1.00	0.12 max	0.05 max	0.20–0.90	0.50	.....	0.40–1.00	1.00	Zr 0.10	50,000	70,000	22
Medium Manganese	Bethlehem Steel Co.	0.25	1.10–1.60	0.04 max	0.05 max	0.30	0.20–0.35	.....	.....	.....	.....	50,000	75,000	20
Manganese Vanadium	Bethlehem Steel Co.	0.22 max	1.25 max	0.04 max	0.05 max	0.30 max	0.20 min	.....	.....	.....	V 0.02 min	50,000	70,000	22
N-A-X High Tensile	Great Lakes Steel Corp., Republic Steel Corp., Sharon Steel Corp., Granite City Steel Co. (2)	0.15 max	0.50–1.00	0.04 max	0.05 max	0.60–0.90	0.25 max	0.20 max	0.40–0.70	.....	Zr 0.05–0.15	50,000	70,000	22
N-A-X Finegrain (3)		0.18 max	0.50–1.00	0.04 max	0.05 max	0.50–0.90	0.25 max	.....	.....	.....	Zr 0.05–0.15	50,000	70,000	22
N-A-X High Manganese	Great Lakes Steel Corp.	0.25 max	1.10–1.60	0.045 max	0.05 max	0.30 max	0.20 min	.....	.....	.....	.....	50,000	70,000	22
Par-Ten	United States Steel Corp.	0.12 max	0.75 max	0.03 max	0.04 max	0.10 max	.....	.....	.....	.....	V 0.01–0.07	45,000	62,000	28
Republic "50"	Republic Steel Corp.	0.15 max	0.50–1.00	0.04 max	0.05 max	.....	0.30–1.00	0.10 min	0.30 max	0.40–1.10	.....	50,000	70,000	22
Republic "M"	Republic Steel Corp.	0.25 max	1.10–1.60	0.045 max	0.05 max	0.30 max	0.20 min	.....	.....	.....	.....	50,000	70,000	20
Tri-Ten	U. S. Steel Corp.	0.22 max	1.25 max	0.040 max	0.05 max	0.30 max	0.20 min	.....	.....	.....	V 0.02 min	50,000	70,000	22 (1)
Stelcoloy #1	Steel Co. of Canada	0.15 max	0.60–0.90	0.08–0.12	0.04 max	0.25 max	0.40–0.60	.....	.....	0.60–0.70	.....	50,000	70,000	22 (1)
Stelcoloy #2	Steel Co. of Canada	0.14 max	1.10 max	0.04 max	0.04 max	0.25 max	0.30–0.40	.....	0.40–0.60	0.40–0.60	.....	50,000	70,000	22 (1)
Yoloy	Youngstown Sheet & Tube Co.	0.15 max	0.75 max	0.10 max	0.05 max	0.30 max	0.75–1.25	.....	.....	1.50–1.85	.....	50,000	70,000	22
Yoloy E	Youngstown Sheet & Tube Co.	0.18 max	0.90 max	0.10 max	0.05 max	.....	0.20–0.50	0.40 max	0.20–0.35	0.40–1.00	.....	50,000	70,000	22
Yoloy M	Youngstown Sheet & Tube Co.	0.25 max	1.10–1.60	0.045 max	0.05 max	0.30 max	0.20 min	.....	.....	.....	.....	50,000	75,000	20
Yoloy M Grade A	Youngstown Sheet & Tube Co.	0.25 max	1.60 max	.....	.....	0.30 max	Optional	.....	.....	.....	.....	50,000	75,000	20
Yoloy M Grade B	Youngstown Sheet & Tube Co.	0.23 max	1.40 max	.....	.....	0.15–0.30	0.20 min	.....	.....	.....	.....	45,000	70,000	22

(1) Steels with copper over a minimum of 0.60 will respond to precipitation hardening, resulting in a higher strength level, depending on time-temperature cycle performed.
(2) Licensed: not presently producing.
(3) All licensees for N-A-X High Tensile are also licensed to produce N-A-X Finegrain.

PROPERTIES & TYPICAL APPLICATIONS: Strength of these steels as measured by their yield point is about 50 per cent higher than structural carbon steel. Working stress in tension can be as much as 50 per cent more. Besides higher yield strength, they have good corrosion, abrasion & fatigue resistance & can be fabricated by usual methods. Some applications: Tanks, trailers, trucks, material handling equipment, auto frames, wheels & bumpers, railroad cars, pole line hardware, earthmoving equipment, mine cars, agricultural equipment, bridges, buckets, LPG cylinders, screens, towers, booms, cranes, dipper sticks, locomotive parts, mobile lifting equipment, portable military bridges, canal locks, gates & dams, lamp posts, auto jacks, cable reels, stokers, furnace bodies, cabinets & re-usable shipping containers.

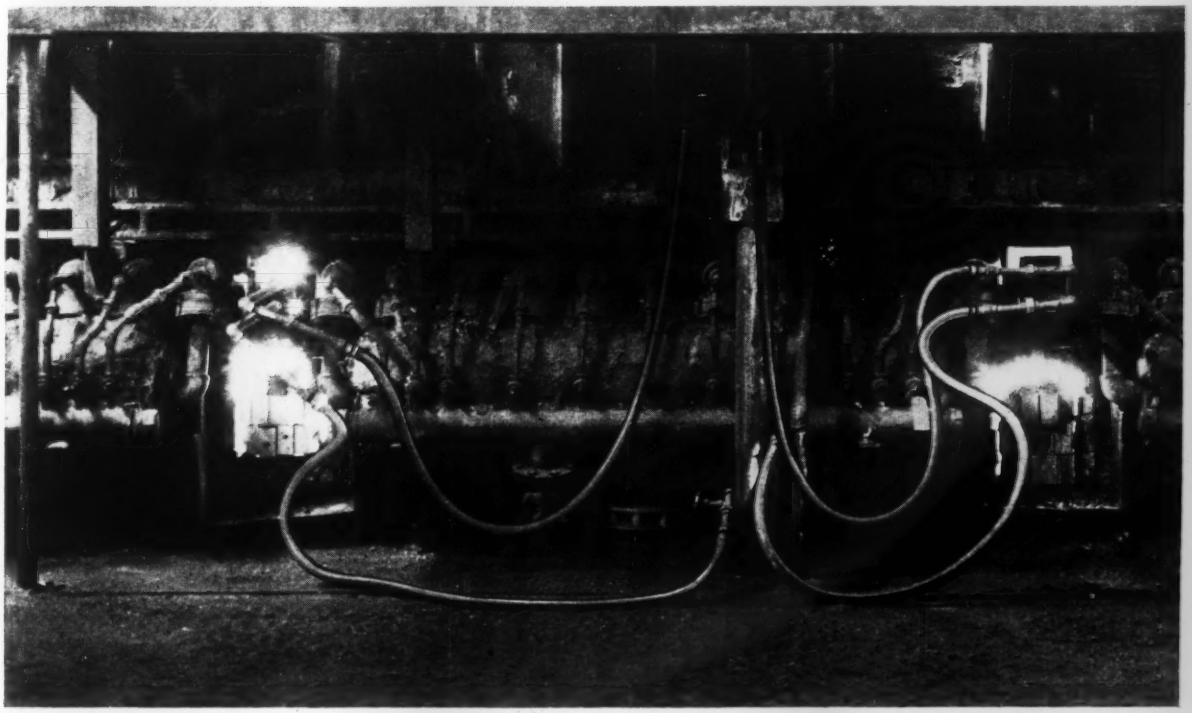
SUPERSTRENGTH STEELS

Material	Nominal Composition	Tensile Strength—Psi
SAE 4340 (AMS-6415)	C 0.40; Mn 0.65; Si 0.30; Cr 0.80; Ni 1.80; Mo 0.25	260,000 to 280,000
SAE 4360	C 0.60 version of 4340	280,000 to 300,000
Crucible HY-Tuf (AMS-6418)	C 0.25; Mn 1.30; Si 1.50; Ni 1.80; Mo 0.40	230,000
Crucible UHS-260	C 0.35; Mn 1.25; Si 1.85; Cr 1.25; V 0.20; Mo 0.35	260,000 min
Crucible UHS-280 or UHS-300	Formerly High Carbon Super HY-Tuf. Available in experimental quantities only	280,000 to 300,000 range
U. S. Steel USS Strux (Mod. 98BV40)	C 0.35; to 0.40; Mn 0.85; Si 0.70; Ni 0.80; Cr 0.75; Mo 0.50; V 0.06; B 0.0015	260,000 to 280,000
U. S. Steel USS Strux (Mod. 98BV40)	C 0.40-0.45 version of above	280,000 to 300,000
SAE 4330 modified with Vanadium (AMS-6427)	C 0.30; Mn 0.90; Si 0.30; Ni 1.80; Cr 0.85; Mo 0.45; V 0.05-0.10	220,000 to 240,000
Timken H.S. 220 (AMS 6407)	C 0.30; Mn 0.70; Si 0.60; Ni 2.05; Cr 1.20; Mo 0.45	220,000 to 240,000
Timken H.S. 260	C 0.40; Mn 0.70; Si 0.60; Cr 1.20; Ni 2.05; Mo 0.45	260,000 to 280,000
Timken 4741	C 0.36-0.44; Mn 0.60-0.90; P 0.040 max; S 0.040 max; Si 0.40-0.60; Cr 0.75-1.10; Ni 0.70-1.00; Mo 0.30-0.40	300,000 max
Vanadium Alloys VascoJet 1000	C 0.40; Si 0.90; Cr 5.00; Mo 1.30; V 0.50	220,000 to 300,000
Inco Ultra High Strength Steel	C 0.40; Mn 0.70; Si 1.60; Ni 1.90; Cr 0.90; Mo 0.45; V 0.07; Al 0.02	280,000 to 300,000
U. S. Steel Air Steel X-200	C 0.43; Mn 0.85; Si 1.50; Cr. 2.00; Mo 0.50; V 0.05	280,000 min

APPLICATIONS: In their appropriate tensile strength ranges, these steels are designed to provide the maximum usable strength where minimum weight is of primary importance. Uses are in aircraft landing gear & airframe components, wing pylon parts & fasteners, wing attachment fittings & superstrength bolts. Other applications: Sheet or plate parts for supersonic speeds, pressure vessels for aircraft use, oil well perforating guns & carbide bit bodies. Examples of other constructional parts are axles, gears & shafting of all types. Although the acceptance of many of these superstrength steels will be a gradual process, today's trend toward machines & equipment operating at higher & higher stress levels will increase their ultimate use in many ways.

PEERLESS WATER HOSE

BIG STEEL MILL DEPENDS on U.S. PEERLESS WATER HOSE to prevent pipe skid burn



In the Fretz-Moon furnace of this Kaiser Steel Mill in Fontana, Calif., one length of U.S. Peerless® Water Hose ("the hose with the good brown cover") carries cold water to the pipe skids, another length carries the return hot water—up to 200° F. If the hose should fail or kink, the pipe skids would burn up and costly repairs and downtime would follow.

Kaiser Steel depends on Peerless to safeguard valuable skids and keep its pipe mill in operation. U.S. Peerless is part of the complete line of U.S. Rubber's industrial hose, engineered for use and abuse.

• • •

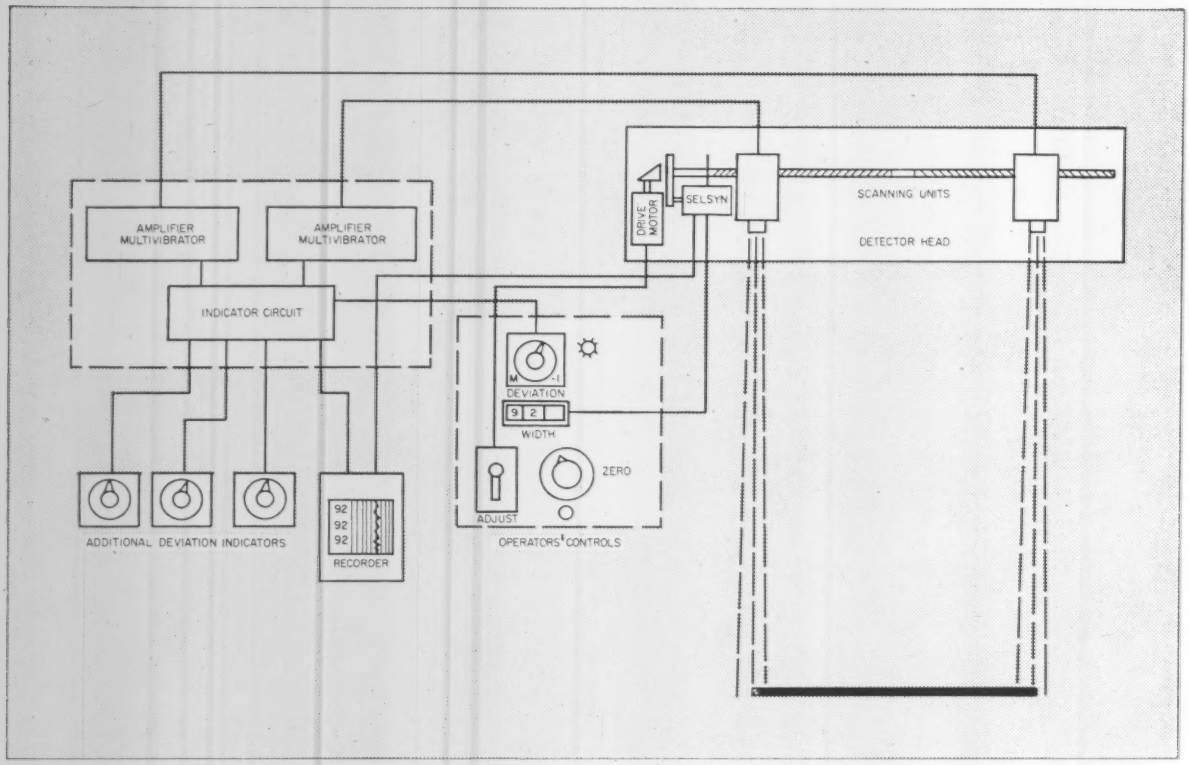
When you think of rubber, think of your "U.S." Distributor. He's your best source of on-the-spot technical aid, quick delivery and quality industrial rubber products.

Mechanical Goods Division

United States Rubber

WORLD'S LARGEST MANUFACTURER OF INDUSTRIAL RUBBER PRODUCTS

Rockefeller Center, New York 20, N.Y. In Canada: Dominion Rubber Company, Ltd.



Scheme of General Electric hot strip width meter

Width Meters Trim Strip Waste

Material is sometimes rolled as much as ½ in. too wide to allow for the trimming of rough edges. Automatic gages for wide, tandem hot mills permit closer tolerances

LOOK for improvements in the control of hot strip width, which is now a manual gaging operation.

Automatic noncontacting gages are typical of new equipment likely to be installed. They have not gained the popularity of noncontacting thickness gages, but the savings they offer make them natural steps in the march of automation through the mills.

Optical Systems—A typical width gage uses photocell detectors which follow the edges of the hot strip by the radiation they emit. Electromechanical circuitry translates what the photocells see into a running record of strip width. The record may be used for manual or automatic correction of the mill.

Four companies are making the gages: Two in the U. S. (General Electric Co. and Industrial Gages Corp.) and two in England (Davy-United Engineering Co. Ltd. and Evershed & Vignoles Ltd.).

The gages are rather similar in operation. They are mounted well above the mill where they will be relatively unaffected by the heat and steam present near the hot strip surface. The best accuracy claimed is plus or minus 1/16 in.

Beam Splitting Gage—The most recent addition to this family of width meters is one which uses a split beam of light from a point source, instead of radiation from the strip itself, to monitor the width of the strip. It's a development of the British Iron & Steel Research Association.

The gage is installed on a Morgan mill which rolls narrow strip for the fabrication of welded tubing. Close control of width is vital to prevent heavy wastage when edges are trimmed for welding.

The strip emerges from the Mor-

For Coiling and Sheeting Applications

Stamco has equipment available in a wide range of sizes and speeds for coiling and sheeting applications in mill, warehouse or factory. These bulletins tell the complete story. Request them by number on your letterhead. No obligation.

STAMCO, Inc., New Bremen, Ohio

How to reduce Investment in costly Steel Inventories

You can eliminate costly, large-scale inventories by taking advantage of the services maintained by your steel service centers. Varied steel stocks and modern processing equipment make available the grades, shapes and sizes of steel you need . . . on just a few hours' notice.

Alan Wood supplies major steel warehouses with top quality products which help them meet customer requirements.

Call your nearest steel warehouser today. Ask him how he can help you reduce your steel inventory and at the same time free your capital for new, more profitable uses.

ALAN WOOD STEEL COMPANY

steelmasters for more than a century and a quarter • CONSHOHOCKEN, PA.

DISTRICT OFFICES AND REPRESENTATIVES: Philadelphia New York • Los Angeles • Atlanta • Boston • Buffalo • Cincinnati Cleveland • Detroit • Houston • Pittsburgh • Richmond • St. Paul San Francisco • Seattle

Montreal and Toronto, Canada—A. C. Leslie & Co., Limited

IRON PRODUCTS
"Swede" *pig iron*

STEEL PRODUCTS
Plates (sheared)
A.W. Dynalloy (high strength steel)
Hot rolled sheets
Hot rolled strip
Cold rolled sheets
Cold rolled strip

ROLLED STEEL FLOOR PLATE
A.W. Algrip abrasive
A.W. Super-Diamond pattern

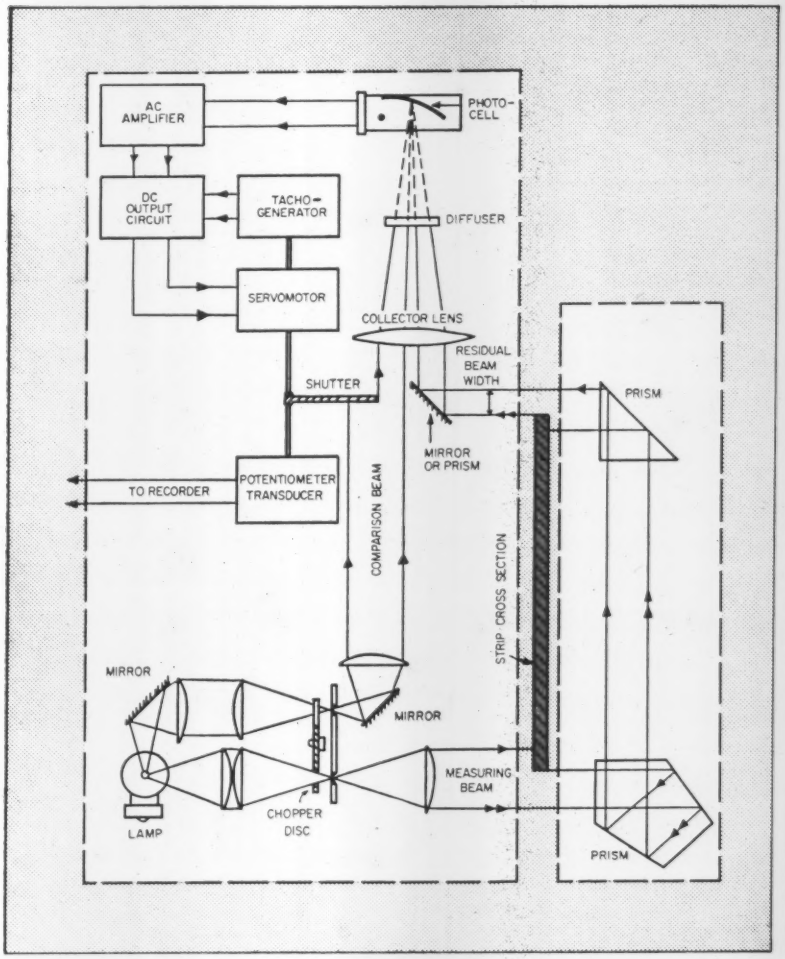
COAL CHEMICALS

A.W. CUT NAILS
Standard & Hardened

MINE PRODUCTS
Iron ore concentrates
Iron powder
Crushed stone
Sand

COKE
Foundry, industrial & metallurgical

PENCO METAL PRODUCTS DIVISION
Steel cabinets, lockers & shelving



BISRA width meter for a Morgan mill

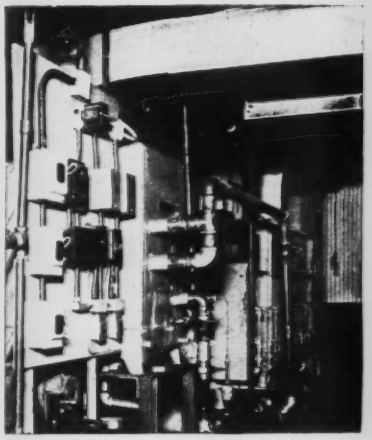
gan mill on edge, and the gage straddles it closely.

Beam Comparison—One beam of light from an incandescent source is passed across both edges of the strip by a mirror and prism system. The strip acts like a shutter, cutting off part of the beam. A second beam from the same source is cut by an adjustable shutter which simulates the proper width of the strip. The two beams are compared electronically, and corrections are made in the mill to change the strip width, so that the light beam cut by the strip will match the comparison beam.

The prototype model has a reported accuracy of plus or minus 0.005 in. Because it uses an outside light source, its use is not confined to heated strip. But its proximity to the strip probably makes it more vulnerable to damage.

Growth Picture—About 25 gages using radiation from the strip as the light source are in operation in the U. S. There are a few in other countries. They range in cost from about $15,000 to $30,000—cost depends on the ruggedness of the installation and the extent of automatic control.

Savings stem from the ability of mills to roll closer to minimum width. On a big coil, savings could amount to 500 lb, or about 1 per cent of coil weight—the equivalent of increasing mill yield by one coil for every 100 rolled.



Improve Quenching and You Get Better Heat Treating

● The NIAGARA *Aero* HEAT EXCHANGER transfers the heat from the quench bath to atmospheric air. It never fails to remove the heat at the rate of input, giving you real control of the quench bath temperature. This prevents flashing of oil quenches. In all cases it improves physical properties, saves loss of your product from rejections and gives you faster production, increasing your heat treating capacity. You can put heat back into the quench bath to save the losses of a "warm-up" period.

Savings in piping, pumping and power as well as great savings in cooling water return the cost of the equipment to you in a short time. The Niagara *Aero* Heat Exchanger saves nearly all of the water consumed by conventional cooling methods.

For the complete story of other benefits and savings, write for Bulletins 120 and 132.

NIAGARA BLOWER COMPANY
Dept. S-10, 405 Lexington Ave.
NEW YORK 17, N. Y.
District Engineers in Principal Cities of U. S. and Canada

DU PONT REG. U.S. PAT. OFF. *PRODUCT NEWS*

EXCLUSIVE "HIGH-SPOT" WORKSHEET is used by Du Pont Technical Representative in helping you make a cost analysis. He'll help you determine required data on investment and operating costs . . . can usually work out the results in one hour or less. Call your distributor of "Triclene" D trichlorethylene today for this unique Du Pont service!

Now . . . analyze your metal cleaning costs in one hour or less!

Exclusive Du Pont "High-Spot" cost analysis gives you facts you need to meet competition and rising costs

With Du Pont's new "High-Spot" cost analysis method, you'll be able to price the cleaning of new parts more accurately . . . find out where your present metal cleaning costs are out of line—see how you can clean metals more profitably. This unique method was developed by Du Pont to give you a quick, reliable way to pinpoint your *complete* costs of cleaning—not just the obvious (and often misleading) costs of the solvents or chemicals alone.

The need for accurate analysis

Competition and rising costs make it necessary for all fabricators to analyze manufacturing costs accurately. Du Pont's exclusive "High-Spot" method—a condensation of Du Pont's original, more comprehensive cost analysis—gives large, medium and small firms an easy way of getting vital answers to meet changing production demands.

In one hour or less—the answer and direction

"High-Spot" helps you make an analysis of your present cleaning costs . . . or a side-by-side comparison of competitive cleaning methods handling the same job . . . in one hour or less. With the results of the analysis, you can frequently find ways to trim out-of-line costs, or select the most efficient process if you're expanding.

Planning a new product or part?

Let a "High-Spot" cost analysis take the guesswork out of estimating that new job. As with all our Technical Services to fabricators, "High-Spot" is available through your local distributor of "Triclene" D trichlorethylene. Call him today. He'll arrange for a Du Pont Technical Representative to help you with a "High-Spot" cost analysis. It may point the way to saving thousands of dollars.

Get facts about "High-Spot" cost analysis from your Du Pont Technical Representative.

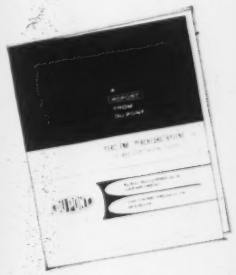
This folder contains the actual form used in a "High-Spot" analysis . . . explains the method . . . lists facts needed to do an analysis. Ask your distributor of "Triclene" D to have a Du Pont Technical man explain this new Du Pont service, or check the box in the coupon at right.

FOR MODERN METAL CLEANING

New Du Pont report tells why "Perclene" perchlorethylene is the ideal solvent for cold cleaning

You'll find this authoritative Du Pont report extremely useful if you do any cold cleaning of metal parts, motors and other maintenance operations, etc. It's a factual, straightforward presentation of basic information about the properties of various solvents now used for cold cleaning.

This new Du Pont report shows why "Perclene" perchlorethylene is superior to other cold cleaning solvents in safety . . . is less expensive . . . is inherently stable and so can be repeatedly reclaimed by simple distillation. It further shows why "Perclene" cleans better in many cases because of its slower rate of evaporation.



Of particular interest to safety engineers and production supervisors are the safety advantages of "Perclene". One easy-to-read table compares the vapor concentrations of "Perclene" perchlorethylene with methyl chloroform in typical cold cleaning applications. These concentrations are expressed as percentages of Maximum Allowable Concentration (MAC) of the solvents compared and show the greater safety of "Perclene" in most cold cleaning applications.

If you have any cold cleaning operations, you'll want this new report. Ask your distributor for a copy, or mail coupon below.

Here's how you profit by buying Du Pont TRICLENE® D: trichlorethylene

you profit because you stay in the lead!

For over 32 years progressive fabricators have profited from Du Pont research on vapor degreasing—research aimed at developing solvents and methods that insure high-quality, low-cost cleaning. Buyers of Du Pont "Triclene" D trichlorethylene stay ahead of their competitors because they are the first to realize the cost and quality advantages of the solvent which is years ahead. In addition, they are first to enjoy the benefits of new developments from Du Pont.

Just look at the record:

1925—The first American-made trichlorethylene is produced at Du Pont's Niagara Falls plant.

1926-28—The first stabilized trichlorethylene is developed at Niagara Falls and used in the first American-built vapor degreasers.

1933-47—Du Pont trichlorethylene is used in virtually all of the vapor degreasers operating in this country!

1949—Du Pont announces a revolutionary new concept—neutral stabilization of trichlorethylene for metal degreasing.

1954—Du Pont makes still another major breakthrough in stabilization technology by introducing the new "Triclene" D—now the nationally accepted standard for superior performance in degreasing-grade trichlorethylene.

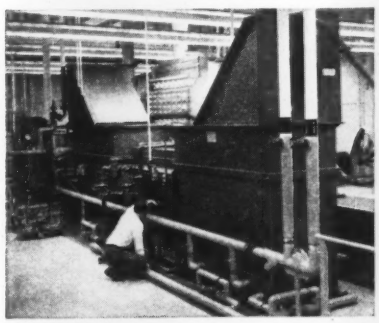
1959—Du Pont will introduce nationally two new metal finishing processes.

(1) A vapor-degreasing trichlorethylene painting process that cleans and paints metal work in a single piece of equipment.

(2) A trichlorethylene based process for "Dry" phosphatizing.

When you buy Du Pont "Triclene" D, you get not only the best degreasing solvent, backed by experienced technical service, but also the latest process-improving developments. *You profit* because you *stay in the lead!*

Your distributor of "Triclene" D trichlorethylene can supply your requirements. Just give him a call, or mail the coupon below.



Plant-scale conveyorized vapor degreaser is used to study metal cleaning problems at new Du Pont laboratory. Extensive equipment is also used to develop improved degreasing techniques.

DU PONT
REG. U.S. PAT. OFF.
BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY

☐ I'd like to know more about "High-Spot" cost analysis

☐ Send me report on "Perclene" for cold cleaning

☐ Send me booklet on Vapor Degreasing

E. I. du Pont de Nemours & Co. (Inc.)
Electrochemicals Department, S-10
Wilmington 98, Delaware

*Name*_____ *Position*_____

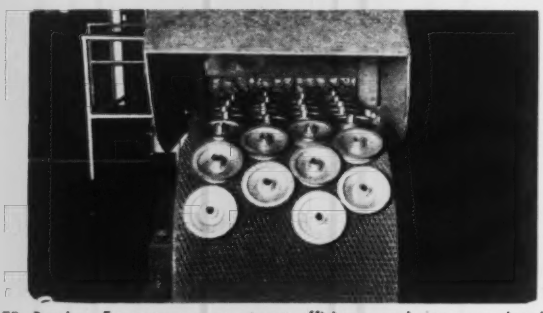
*Present method of cleaning*_____

*Address*_____

*City*_____ *Zone*____ *State*_____

EF Brazing FURNACES

cut material, tooling and finishing costs

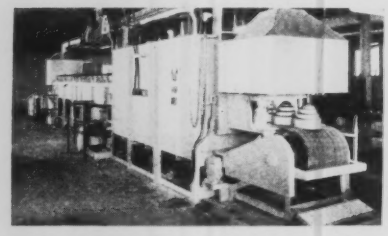


EF Brazing Furnaces assure utmost efficiency and economy, brazing large or small, steel, aluminum and non-ferrous assemblies.

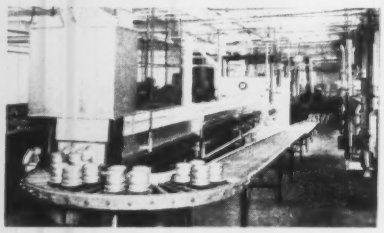
When it's costly to make a part in one piece—make it from several pieces, brazed together. Brazing can save from 50% to 80% in material costs. The brazed piece will probably weigh less—be stronger—withstand shock and vibration better, and wear longer.

Brazing enables you to avoid costly die and tooling charges—and since the finished pieces are discharged from the furnace uniformly bright, smooth and free from scale—plating, lacquering, painting or other finishing costs are greatly reduced.

For best results, let EF engineers, with their wide experience, work with you on your next brazing job. Descriptive folders including many suggested "do's" and "don'ts" sent promptly on request.



EF Continuous Mesh Belt Conveyor Furnaces are used extensively for brazing, bright annealing, drawing and other heat processing. The material is loaded directly on the woven wire belt, uniformly processed and discharged automatically.



This EF Roller Hearth Furnace brazes large steel assemblies which emerge as integral units—scale-free, bright, and undistorted—ready for use. Similar furnaces handle brass, aluminum, copper and other ferrous and non-ferrous products.

BULLETIN No. 461

shows typical installations of EF Gas-fired, Oil-fired and Electric Furnaces.

Send for a copy today!

THE ELECTRIC FURNACE CO.

GAS FIRED OIL FIRED AND ELECTRIC FURNACES FOR ANY PROCESS, PRODUCT OR PRODUCTION *Salem - Ohio*

Canadian Associates • CANEFCO, LIMITED • Toronto 13, Canada

Spray-On Ceramics

Powders fed through flame gun provide coatings reported stable, high in heat resistance

FLAME CERAMICS, a process for coating substances by feeding powdered ceramic materials through a simple flame gun, is said to produce coatings high in resistance to heat and high in chemical stability.

The process was developed in the ceramics and minerals department, Armour Research Foundation of Illinois Institute of Technology, Chicago. World-wide manufacturing rights were granted to Continental Coatings Corp., Chicago.

What It Is—In the flame ceramics process, sintered layers of refractory and chemically inert materials, such as aluminum oxide, zirconium oxide, or rare earth metal oxides are applied through a flame gun to a base material. Coatings of any desired thickness can be built up by continued application.

Preheating Not Necessary—The metal or other base material need not be heated prior to spraying. In conventional ceramic coating methods, both the base material and the ceramic to be applied must be heated to a high temperature.

Many Properties Available — Flame ceramic coatings show high resistance to wear and abrasion, and are chemically inert. They have a high melting point; in many cases the metal under the coating can be melted without failure of the coating itself.

A wide variety of physical, chemical, and electrical properties can be obtained in flame ceramics with the addition of powdered metal, glass, or other minerals to the ceramic material to be applied. Coatings can be used as electrical insulators or conductors, or to protect base material from corrosion. They can be used to protect engine parts from heat and wear, or to insulate electrical components for operation at high temperatures; they can be used as mold coating, permitting precision casting with better metals.

The use of flame ceramics is expected to increase the life of forging tools and dies; it will allow the use of less expensive metals and refractories where resistance to heat and oxidation are required.

TEAL rocket designed by TEMCO AIRCRAFT CORP., Dallas

What's the coolest insulator for hot products?

FORMICA® laminated plastic . . . . withstands 2500° F for 8 minutes in the Navy's XKDT-1 rocket drone. A modified standard Formica grade successfully insulates the solid propellant engine case and blast tube against this inferno.

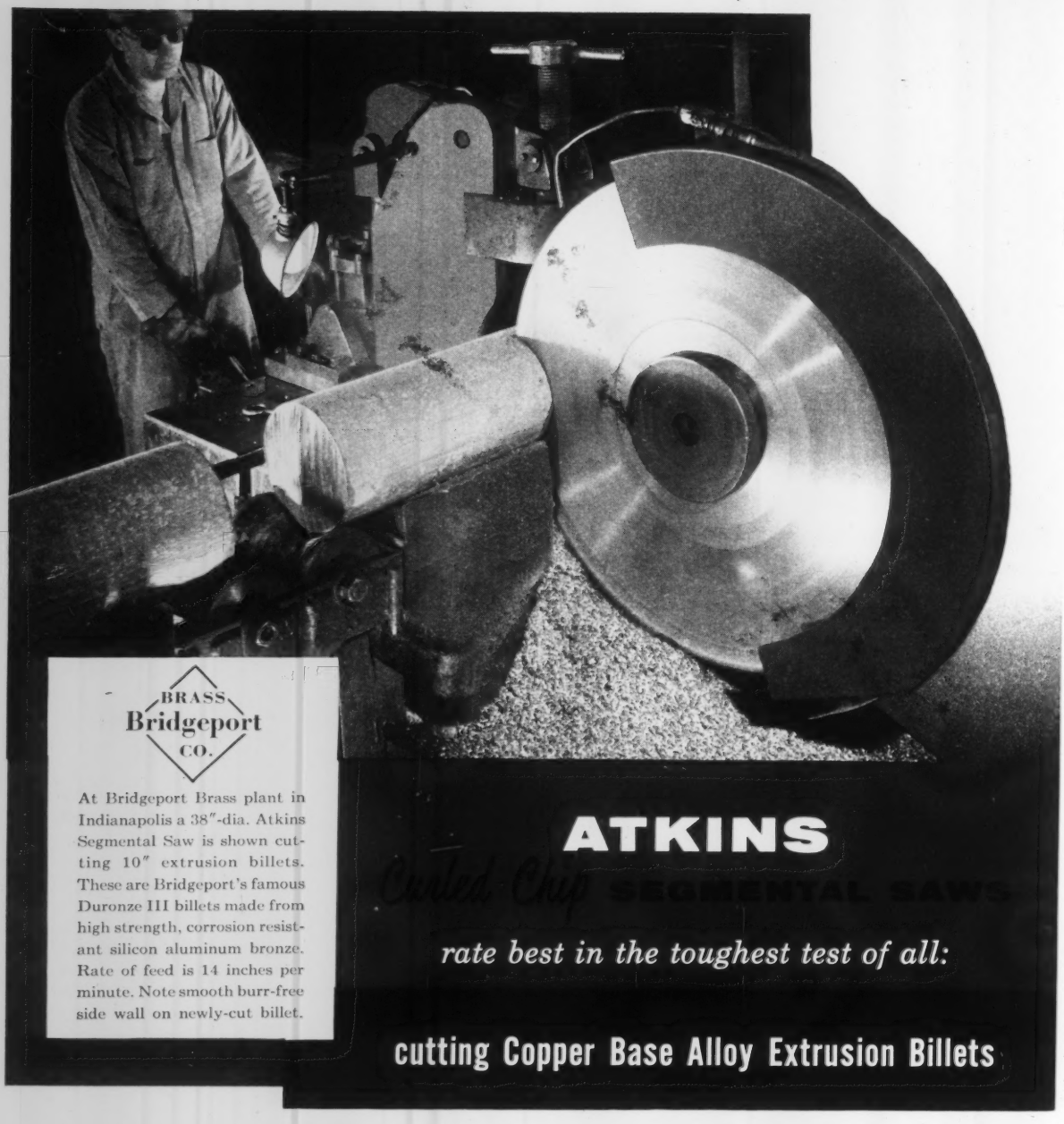
This is the heat insulator Formica research developed by combining great mechanical strength with high heat resistance. It has helped break the heat barrier in aviation, missile and space craft.

This type of heat insulator can be useful in your hot products, too. In fact, product designers are getting more "assists" from Formica laminated plastics than any other material. Standard grades available for immediate use in your projects . . . without extensive delays for research and development. Forty-eight hour Streamliner shipment of most grades. For further information, write for bulletins 829 and 856-A. Formica Corporation, subsidiary of American Cyanamid, 4556 Spring Grove Ave., Cincinnati 32, Ohio.

FORMICA®
Laminated Plastic

a product of CYANAMID

FI-1966



BRASS
Bridgeport
CO.

At Bridgeport Brass plant in Indianapolis a 38″-dia. Atkins Segmental Saw is shown cutting 10″ extrusion billets. These are Bridgeport's famous Duronze III billets made from high strength, corrosion resistant silicon aluminum bronze. Rate of feed is 14 inches per minute. Note smooth burr-free side wall on newly-cut billet.

ATKINS

Curled Chip SEGMENTAL SAWS

rate best in the toughest test of all:

cutting Copper Base Alloy Extrusion Billets

● There's no better way to test a saw's cutting ability than on copper alloy. This hard-to-machine metal clogs conventional tooth gullets and galls the sides of the saw, often stalling the machine.

Atkins' patented "curled chip" tooth design puts an end to these problems. Ordinary saw teeth (Fig. 1) wedge chips into the gullet; Atkins teeth (Fig. 2) *lift* the chips in a continuous curling action. Chips explode from the gullet like suddenly released clock springs, leaving a clean, free-cutting tooth edge.

You can *double your rate of feed* with Atkins "Curled Chip" Segmental Saws. Use them for heavy duty cutting of both ferrous and non-ferrous metals. You'll get more cuts per grind at lower tool cost. And Atkins segments are the economical way to replace worn teeth without discarding the saw plate.

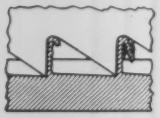


FIGURE 1
Conventional Tooth

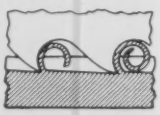


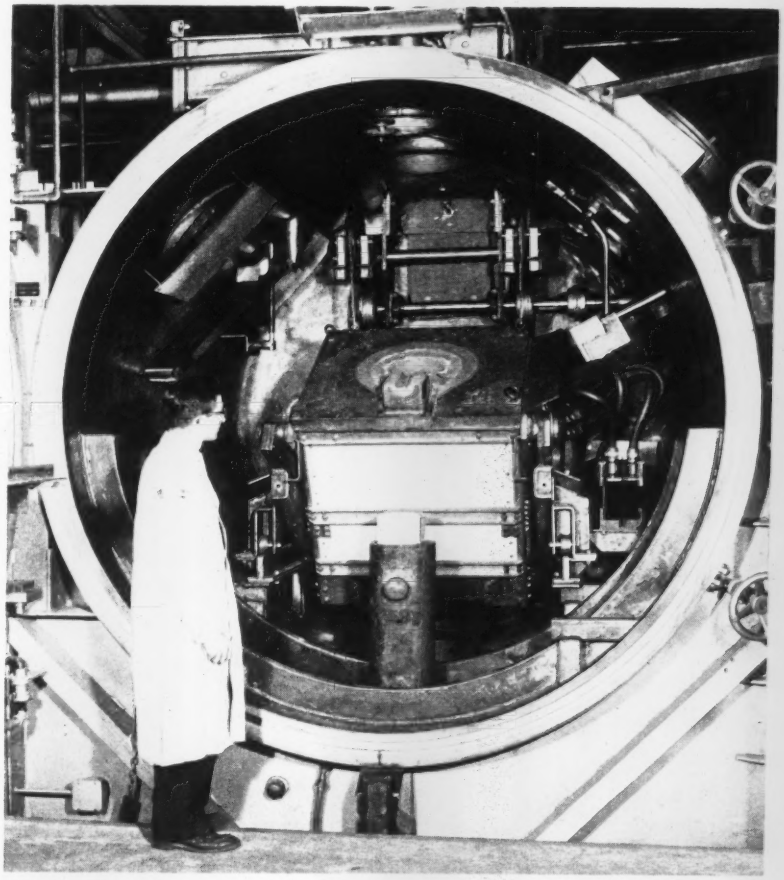
FIGURE 2
Curled Chip Tooth

Write for 16-page Atkins catalog covering circular and band saws for every metal-cutting need.

ATKINS Silver Steel SAWS

ATKINS SAW DIVISION
BORG-WARNER CORP.
Indianapolis 9, Indiana

B-W ENGINEERING PRODUCTION



This is the operating platform of a 2000-lb furnace at Wilbur B. Driver Co., Newark, N. J. Furnace is tilted to show pouring method. Ingot mold is in position below spout

Vacuum Casting Tames Supermetals

It forms parts that can't be made any other way. Benefits include: Longer part life, reduced scrap losses, and lower requirements for costly alloying elements

CASTING finished parts in a vacuum may be our best bet to get tomorrow's supermetals in usable shape for missiles and aircraft.

Today's most powerful engines depend on high temperature turbine buckets and afterburner parts cast that way. Some rocket parts can't be made outside a vacuum. Some elements like titanium and aluminum won't alloy with steel until gases are removed from a melt by the process.

The method also has great potential for more ordinary uses. Consider these advantages:

- Parts last longer under severe operating conditions. (Ball bearing people say they get a 400 per cent increase in bearing life.)
- The method eliminates or minimizes scrap losses.
- It can cut the need for costly alloying elements.
- There are no voids or inclusions in parts to mar subsequent processing.

Who Is Doing It—Fewer than a dozen firms are equipped to do vacuum induction casting. The leaders include: Haynes Stellite Co., a division of Union Carbide Corp., Kokomo, Ind.; Microcast Div., Austenal Inc., Dover, N. J.; Misco Precision Casting Co., Whitehall, Mich.; Wilbur B. Driver Co., Newark, N. J.; Kolcast Industries, a division of Thompson Products Inc., Cleveland.

Costs—Casting a part in a vacuum costs about 30 to 35 per cent more than making it with an air melt, say most experts. All agree that with a high volume, improvements will soon make it possible to cut the differential to around 15 per cent.

A small vacuum installation that will handle 20-lb melts runs $20,000 to $25,000, depending on how many refinements you want. F. J. Stokes Corp., Philadelphia, says that one of 5000-lb capacity can cost as much as $400,000.

Economics Studied—You must be aware of side benefits when you compare costs with those of more conventional methods. For example, one user reports that chemical properties of heats are so nearly identical that variations of properties in magnetic steels have been eliminated.

You must also calculate part life. One springmaker gets nearly five times longer life when his products are made of vacuum cast steels.

A. D. Garwood of Stokes Corp. points out that some areas are more important than economy. Take nickel-base alloys: It isn't possible to add titanium and similar alloys without first removing all oxides and free gases. (That includes pouring.)

Practice—Furnace operators say it's easy to establish certain routines to insure minimum costs. Downtime has to be kept low because overhead on some installations runs $1000 an hour. Procedures often must be tied in with other processes like heat treating.

Austenal points out that an ag-

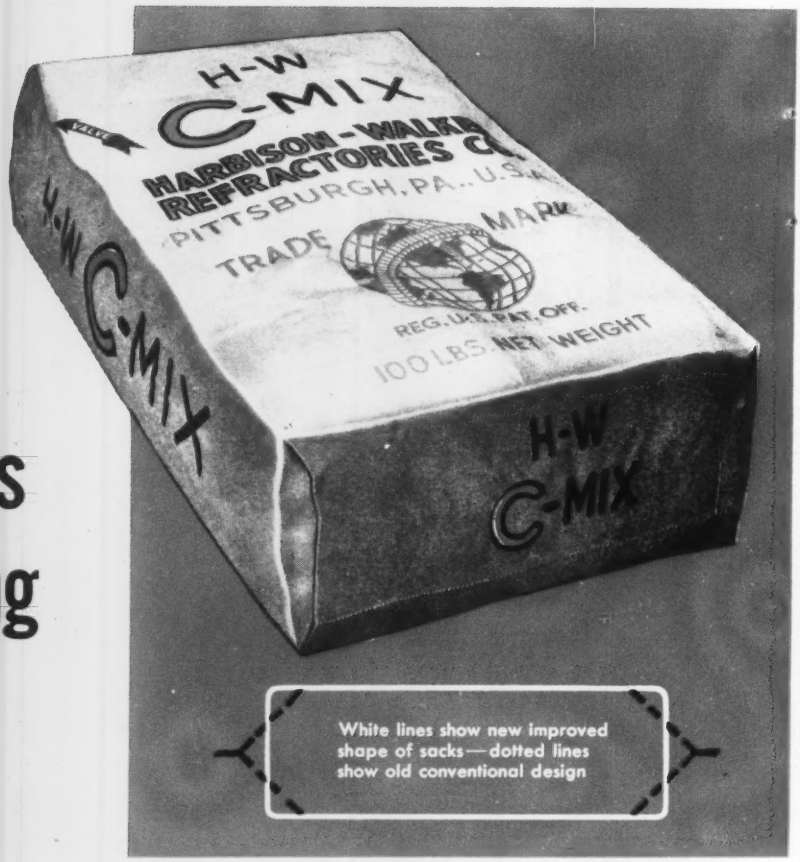
(*Please turn to Page* 194)

NOW...

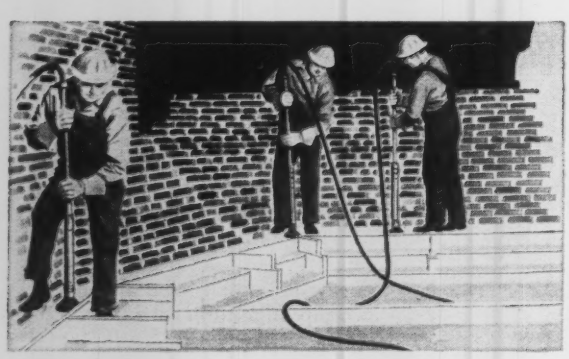
another added benefit...

square-end sacks facilitate handling and storage of Harbison-Walker

C-MIX and MAGNAMIX



H-W C-MIX (high purity seawater periclase) used for contour-rammed open hearth and electric furnace bottoms greatly reduces furnace downtime, saves labor and avoids burning-in sacrifice of refractory superstructure. And with its measurable margin of superior properties, costs are decidedly lower and furnace availability is greatly increased.



HIGH MAGNESIA CONTENT — Made from high purity seawater periclase with the magnesia content over 92%, H-W C-MIX best withstands the corrosive action of highly basic slags.

STABLE — It is fully converted to periclase and has excellent volume stability with negligible shrinkage at highest operating temperatures.

HYDRATION RESISTANT — H-W C-MIX is unique in its high degree of resistance to hydration.

STRONG — High strength over the entire range of steel furnace temperatures accounts for its excellent resistance to erosion.

DENSE — High density and low permeability retard penetration by molten metal and corrosive slags.

ECONOMICAL — H-W C-MIX provides the most durable monolithic hearths with low installation costs.

World's Most Complete Refractories Service

®

RAMMING MIXTURES

H-W MAGNAMIX of 80% magnesia content stabilized as periclase, is made from dead-burned Washington magnesite. It is particle-sized to secure maximum density. While H-W MAGNAMIX is dependable for making new bottoms, it is especially adapted for bank maintenance, patching deep holes and repiping tapholes. It sinters into a hard dense monolith in a very short time at approximately 1000° F. lower than operating temperatures.

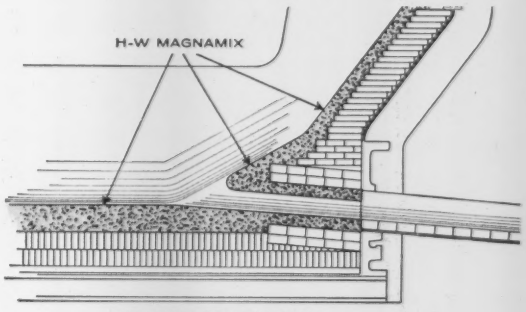
HIGH MAGNESIA CONTENT — It is used without the addition of slag or scale, thus avoiding dilution of its high magnesia content.

DENSE — As rammed into place, it becomes exceedingly dense and impermeable. When heated to operating temperatures, its density is further increased and a homogeneous monolith is formed.

STRONG — H-W MAGNAMIX has a strong cold set with the unusually high crushing strength of 1500 psi.

DURABLE — Its excellent resistance to erosion accounts for its splendid records and wide adoption in taphole service.

EASY TO USE — It has superior properties for patching large holes in banks and bottoms, and is applied by air-ramming, gun placement or by hand in hot patching.

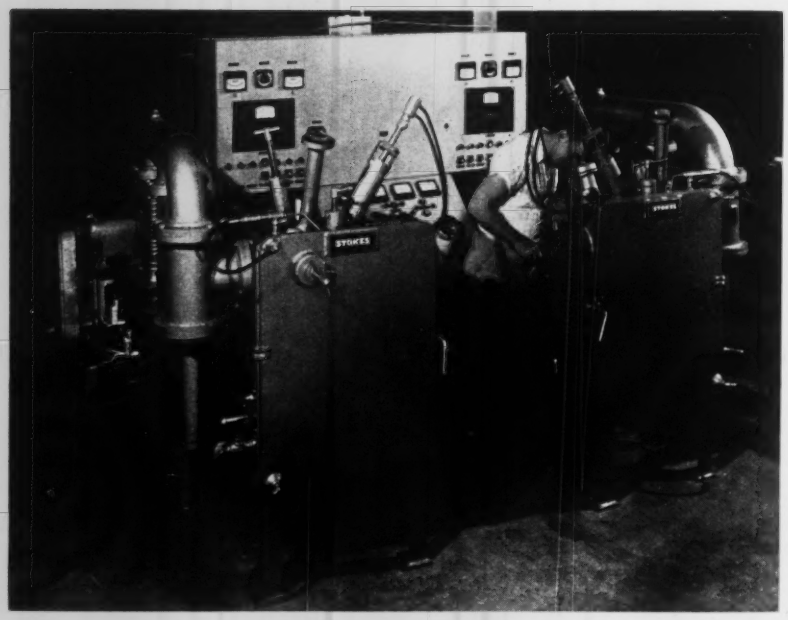


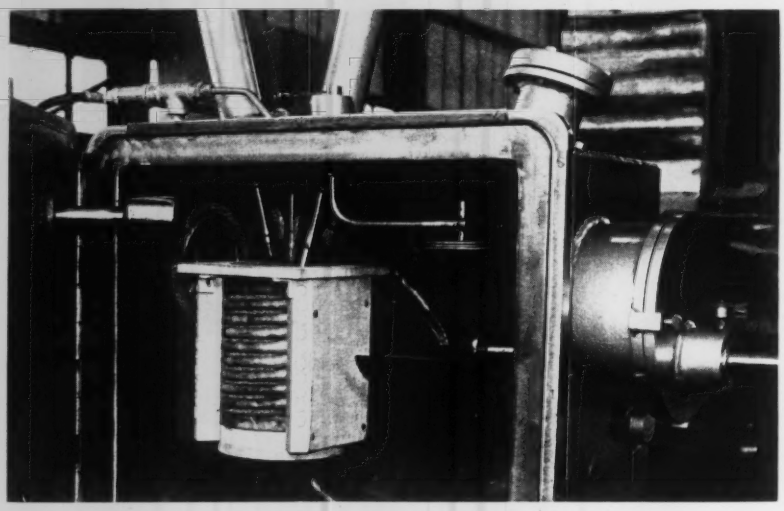
CROSS-SECTION AT TAP HOLE

HARBISON-WALKER REFRACTORIES COMPANY

AND SUBSIDIARIES

General Offices: Pittsburgh 22, Pennsylvania





Furnaces like this one (17-lb melts), are becoming commonplace, say equipment makers. Tandem arrangement is for continuous work. Close-up (below) shows induction crucible

gressive approach is needed to keep cycle times low and that a lack of insistence on quality can be quite expensive.

What They Do—It's hard to beat a vacuum for keeping metals clean, says Marcel Goldenburg, Kolcast metallurgist. The technique makes an exceptionally high grade product, and you can add some alloying elements that would otherwise oxidize in air.

Wilbur B. Driver uses a 2000-lb furnace to cast special alloys for electronic tubes and instruments used in high temperatures. It started with a small unit, gained some experience, and graduated to the larger unit when it developed a capable team of operators. (Stokes points out that one-man units are comparatively simple to run.)

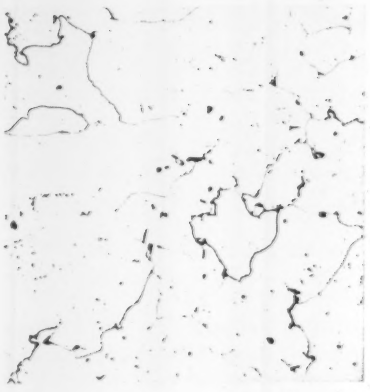
Operating Cycle — An initial charge is placed in the furnace and chamber evacuated. (Vacuum units should pull a pressure of 1 to 5 microns in about 20 minutes.) Power is then applied, and as the charge starts to melt, additional metal is added from a charge chamber. When the charge is molten, alloying elements can be added from a separate additions chamber.

Depending on shape, the vacuum is kept below 10 microns during melting and pouring. In the late stages, a technician monitors the gas being driven off (samples are checked in a mass spectrometer). As soon as an immersion thermocouple indicates correct bath temperature, the batch is poured, the mold moved into the cooling chamber, and the furnace is ready for another charging.

Temperature Important—Castings with intricate details make up a large part of investment casters' output. Such parts require exceptionally accurate temperature control during pouring. Most operators find immersion thermocouples the only way around cloudiness and degassing problems that interfere with optical methods of measurement.

Induction Problems—J. B. Wollaston, Inductotherm Corp., Delanco, N. J., points out that induction is the most widely used heat source. It permits close control of melting and degassing, and it's particularly effective with iron and nickel alloys.

Despite such good features, equip-



X100 Haynes Stellite Co.

Photomicrograph of vacuum induction cast Udimet 500 gives graphic idea of fine grain. (ASTM size 2 to 3) Air melts of this metal would produce grains nearly a thousand times larger

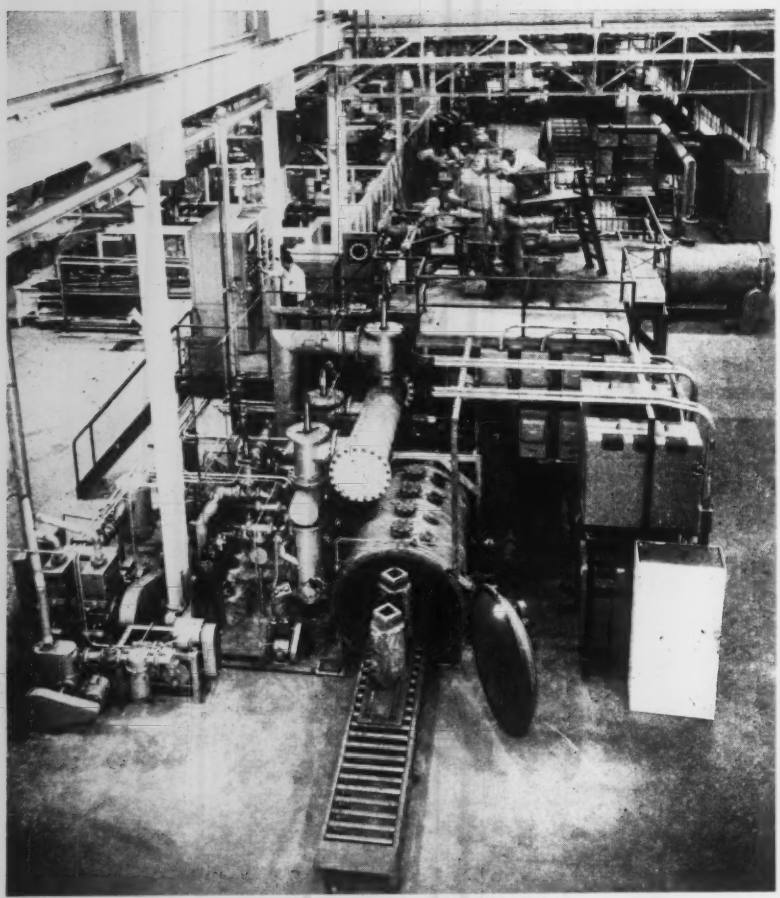
GOOD SIGN FOR BEARING BUYERS! On Michigan's famed Willow Run Expressway, signs like the one above point to the newly completed Hoover plant. Here, new equipment and modern techniques are skillfully utilized to produce increased quantities and additional types of America's *Quality* Balls and Bearings. Hoover has made these major improvements to provide better service for present customers . . . to serve more and more new customers. You are invited to write for complete information about Hoover products. Watch Hoover for future announcements of interest to bearing buyers.

hoover

BALL AND BEARING COMPANY

5400 South State Road, Ann Arbor, Michigan

Los Angeles Sales Office and Warehouse: 2020 South Figueroa, Los Angeles 7, California



Thompson Products' Kolcast Div., Minerva, Ohio, has this 2400-lb installation which handles molds on a continuous basis. Vacuum melt is isolated from mold sections by vacuum locks

ment people are working on several problems: Refractory life, corona losses, arcing, insulation breakdown, vapor and water leaks.

Better grade refractories, particularly the magnesias, have shown improved life (induction heats the lining, too).

Inductotherm's approach to corona and arcing is to lower voltage and increase current (it's five times greater than that of air melting types).

Getting through the vacuum shell with electrical connections has been a great barrier. A simple insulating disc, properly sealed with two or more metal lead-throughs is often adequate, but the exposed metal parts have proved difficult to insulate and the added water connections increased the water leak hazard.

Many firms have tried the coaxial cable idea (a single line inside a tube). Biggest advantage: It doesn't heat the tank. Voltage drop is also at a minimum, and, theoretically, it is an ideal way to carry high frequency electricity.

Inductotherm and some others favor flexible leads connected to lead-throughs with plug-type seals. The setup permits easier furnace tilting for pouring. Using several keeps losses low, and correct spacing reduces heating of the furnace shell.

The Future?—Mr. Garwood has this to say: "Vacuum furnace melting and casting so far hold the most promise for producing the super-high strength alloys we're going to need to solve space problems. Vacuum metallurgy makes possible alloys that stand up in rocket engines, advanced jets, and nuclear reactors. It produces metal alloys with properties previously unattainable."

Experimental work on alloys containing boron, calcium, lithium, chromium, magnesium, columbium, and tungsten shows promise, says Haynes Stellite.

Another outfit says that within three years it will be making 800-lb cast shapes on a production basis.

Those who need the really tough-to-form metals probably will turn more and more to vacuum castings, think many melters checked by STEEL. They also look for lower ingot prices through more automatic and efficient systems. Says one expert: "Automatic pumping systems are a reality; self-regulating induction systems are just around the corner; a few places already have mold handling equipment operating on a semicontinuous basis."

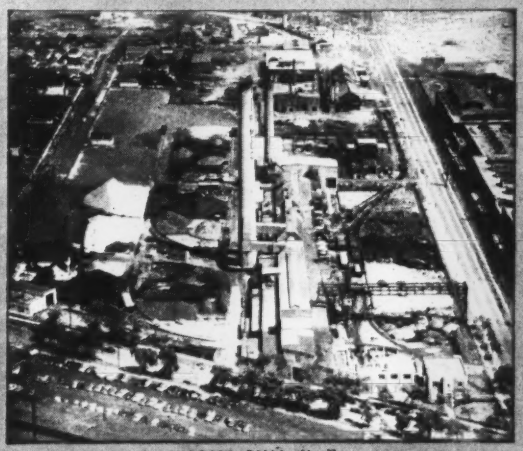
Here's How Costs Compare

	HIGH ALLOY			LOW ALLOY		
	Air	Argon	Vacuum	Air	Argon	Vacuum
Net Cost (per mold)	$65	$92	$96	$41	$68	$72
Selling Price (per mold)	$85	$120	$125	$50	$81	$87

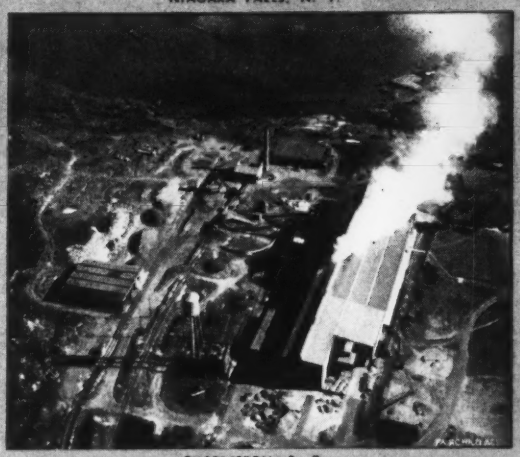
Note: Figures include rejection costs, depreciation, and overhead.

• An extra copy of this article is available until supply is exhausted. Write Editorial Service, STEEL, Penton Bldg., Cleveland 13, Ohio.

Let's Talk About Alloys



NIAGARA FALLS, N. Y.



CHARLESTON, S. C.

CALVERT CITY, KY.

Pittsburgh Met works hand in hand with the steel industry to improve its present products and to develop new methods and alloys which are better suited to the industry's needs. Experimental units are continually in operation in furthering this research.

We fully recognize that the cost of alloys bears a direct relationship to the cost of producing steel. For that reason, we employ and utilize both in research and production the services of personnel who have received their training in the steel industry and who fully understand alloy application and utilization. By so doing we have been unusually successful in bringing about appreciable cost savings by steel manufacturers and have been equally successful in developing and perfecting new alloys to do the job better.

The development and introduction to the steel industry of medium carbon ferrochrome as a substitute for the more expensive low carbon ferrochrome is a definite example of this program of cooperation. Other product refinements growing out of our alloy "know how" have similarly contributed to the steelmaker's art.

Your problems are our problems and we continue to offer our full cooperation and resources in assisting the steel industry to reduce costs while improving quality.

We are a major producer of:

High Carbon Ferrochrome
High Carbon Ferrochrome — Low Sulphur
Medium Carbon Ferrochrome
Low Carbon Ferrochrome Silicon
Ferrosilicon — All Grades
High Silicon Alloy Pig Iron
High Silicon Pig Iron — 14% to 17% Grades
Silico Manganese
Standard Ferromanganese
Special Ferro Alloys

Our plants are strategically located at Niagara Falls, N. Y., Charleston, S. C. and Calvert City, Ky., to serve you promptly via railroad, water transportation and motor freight.

Pittsburgh Metallurgical Company, Inc.

GENERAL OFFICES ..... NIAGARA FALLS, NEW YORK

District Offices

CHICAGO
Board of Trade Bldg.

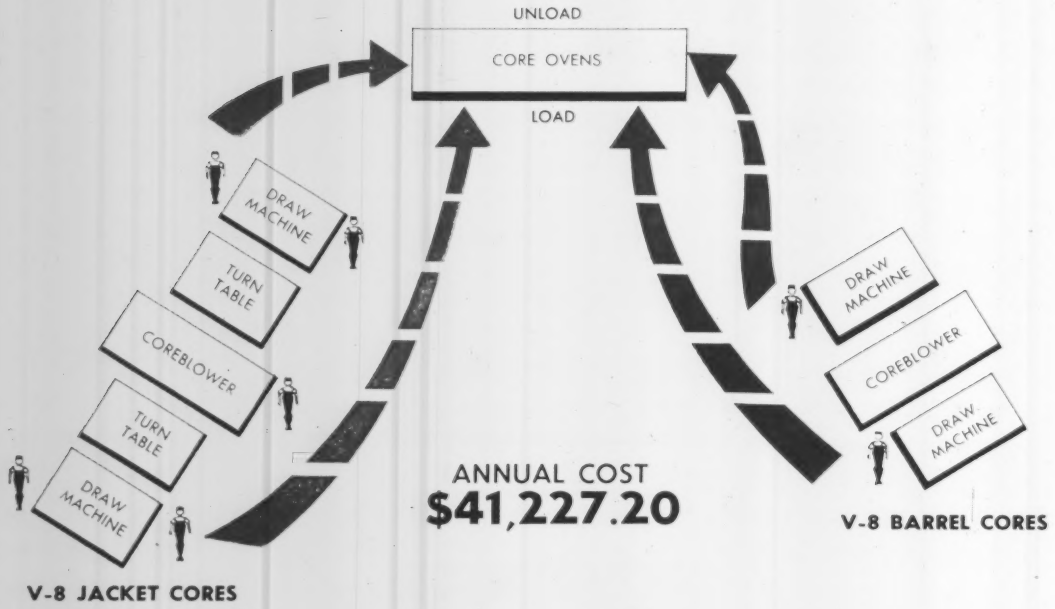
CLEVELAND
Center Bldg.

DETROIT
New Center Bldg.

PITTSBURGH
Oliver Bldg.

BALTIMORE
Mercantile Trust Bldg.

OLD METHOD: Seven men, 50% of cores trucked to oven



How We Beat the Cost Crisis

Foundry Saves $29,448 a Year

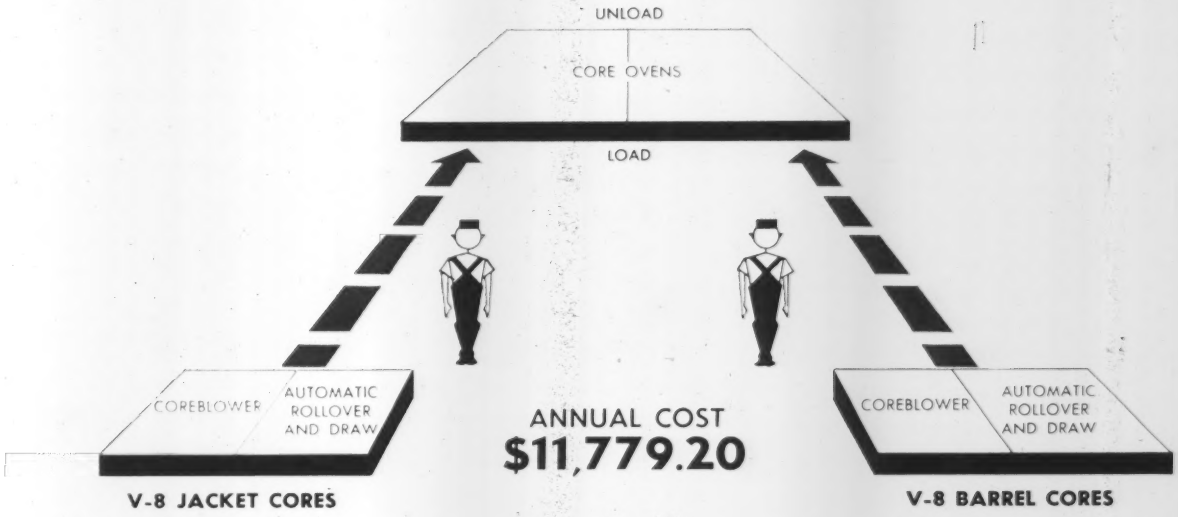
It's another example of how aggressive production planning pays off. Two changes cited here save a total of $46,728 annually. This is one of the top entries in the Cost Crisis Awards Competition. Another will appear next week

EFFICIENT product flow and efficient capital equipment often go together.

Take the case of core production at Studebaker-Packard Corp., South Bend, Ind. G. T. Costas, foundry manager, says the coreroom superintendent figured cores for the V-8 engine block jacket and barrel were being made with obsolete equipment at a heavy cost burden.

Old Way—Seven men were required to run the coreblowers and draw machines to get out the daily requirement. Further, half the

NEW METHOD: Two men, core handling takes less time



cores had to be hauled long distances to the core oven.

Both the equipment and the handling looked inefficient. The production cost S-P $171.78 a day.

New Way—In discussions with core equipment manufacturers, S-P foundrymen worked out a production sequence that would require only two workers—they could do the work of the crew of seven.

Handling costs would be cut drastically, and there'd be a reduction in time lost trucking parts to the core oven.

Go-Ahead—Mr. Costas says that he, the coreroom superintendent and supervisors, pattern shop superintendent, industrial engineers, and cost control men worked out the proposed system and took it to management.

When savings were compared with the total investment needed (about $15,000), the appropriation was approved.

S-P's new cost: $49.08 a day.

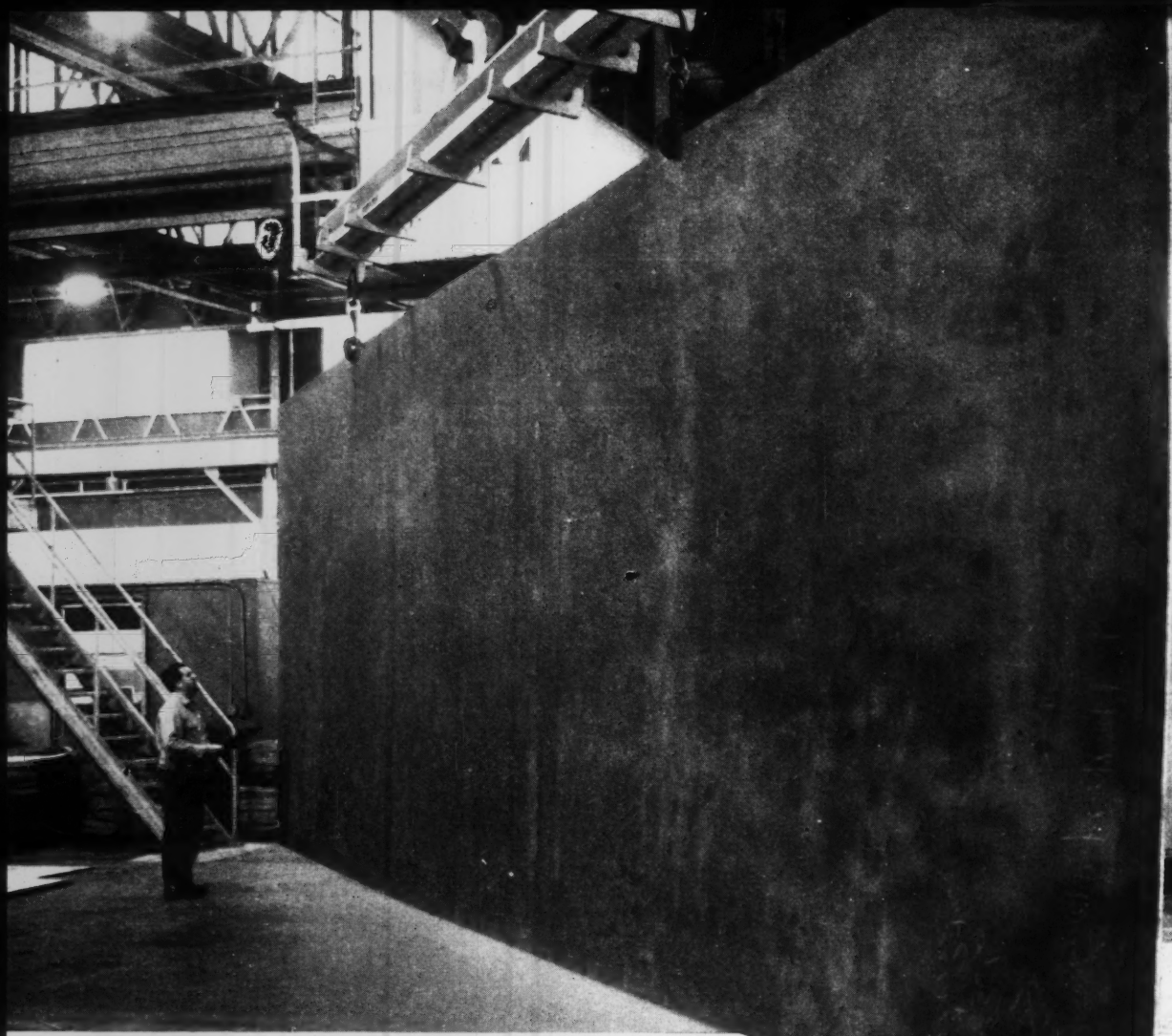
Innovations in Cleaning Room Pay Off

In the foundry cleaning room, 11 men were needed to chip and grind the V-8 cylinder block casting. The cleanup was necessary to prepare the block for the first operation on the transfer machine in the machine plant.

Foundry and machine shop supervisors got together and came up with the idea of incorporating a crushing bar on the transfer machine. It would clean up the pan rail and main bearing partings—and eliminate the job in the foundry cleaning room.

Also, the front and rear end partings were machined instead of being taken off by a portable grinder.

The result of this program: Only eight men are required in the cleaning room, a saving of three men. The new system saves S-P $17,280 a year.



sure it's big

. . . but not particularly big or unusual in Carlson's production of stainless steel plate

IT was normal, but not easy, for Carlson specialists to handle this big plate. Type 304-L stainless, it measured $\frac{7}{16}$" x 131$\frac{1}{2}$" x 452$\frac{9}{16}$" and weighed an impressive 7923 pounds. And when this big one landed at the customer's receiving dock it was *exactly* what he wanted . . . *right* by chemical composition, *right* by physical standards, *right* to specification and *right* to size.

Whatever you need in stainless steel—big plates, small rings, formed or cut-to-shape items—will be produced accurately and on time. Stainless steel is our *only* business, and we know it. That is why you can depend on Carlson to give you *what you want when you want it!* Your inquiry is invited.

G.O.CARLSON *Inc.*

Stainless Steels Exclusively

122 Marshalton Road
THORNDALE, PENNSYLVANIA
District Sales Offices in Principal Cities

PLATES • PLATE PRODUCTS • HEADS • RINGS • CIRCLES • FLANGES • FORGINGS • BARS AND SHEETS (No. 1 Finish)

40th National Metal Exposition and Congress

PROGRAM

CLEVELAND

AMERICAN SOCIETY FOR METALS

Magnetic Properties Seminar

Saturday, Oct. 25—9 a.m.
Statler-Hilton, Ballroom

Presiding Officer: R. M. Bozorth, Bell Telephone Laboratories.

Fundamental Questions in Magnetism—J. H. VanVleck, Harvard University.

Experimental Measurements of Fundamental Magnetic Properties — C. P. Bean, General Electric Research Laboratories.

Nuclear Resonance in Magnetic Materials—R. G. Shulman, Bell Telephone Laboratories.

Clarence L. Lorig, President

Walter Crafts, Vice President

2 p.m.
Statler-Hilton, Ballroom

Presiding Officer: George Craig, University of Toronto.

Ferromagnetic Domain Structure—H. J. Williams and R. C. Sherwood, Bell Telephone Laboratories.

Magnetic Behavior of Thin Films—J. B. Goodenough, Lincoln Laboratories, Massachusetts Institute of Technology.

Magnetic Properties of Fine Particles—T. O. Paine, General Electric Co.

8 p.m.
Statler-Hilton, Ballroom

Presiding Officer: J. J. Harwood, Metallurgy Branch, Office of Naval Research.

Time Effects in Magnetization—G. W. Rathenau, University of Amsterdam.

Sunday, Oct. 26—9 a.m.
Statler-Hilton, Ballroom

Presiding Officer: M. E. Nicholson, University of Minnesota.

Magnetostriction—W. J. Carr Jr., Westinghouse Research Laboratories.

Magnetomechanical Damping — A. W. Cochardt, Westinghouse Research Laboratories.

Magnetic Properties and Temperature—B. L. Averbach, Massachusetts Institute of Technology.

(*Please turn to Page* 204)

KEEPS CUTTING FLUIDS
AS FRESH AS A DAISY

Here's why ELCIDE 75™ can increase the useful life of your soluble oil emulsions

Elcide 75 controls harmful bacteria that enter all oil-water emulsions and cause rancid odor, acidic corrosion, and emulsion breakdown. Prior to the development of Elcide 75, certain bacteria developed immunity to commonly used germicides, and no single inhibitor could control their damage.

Elcide 75 is a combination of proven anti-bacterial agents, including one of the safest and most powerful bacterial inhibitors used in the exacting field of medical surgery today.

Elcide 75 is not a "built-in additive" that is weakened by larger emulsion ratios. With Elcide 75 you know you have an effective, safe treatment because you add it to the emulsion right in your own plant.

Elcide 75 is completely safe for employees, machinery, and products. Not only is it non-toxic and harmless to sensitive skin, but its anti-bacterial action reduces the chance for infection caused by contaminated emulsions. The use of Elcide 75 also reduces the acidic corrosion caused by bacterial decomposition.

Bacteria cause emulsion trouble. This is a photomicrograph of *Pseudomonads*, one of the harmful types of bacteria found in oil-water emulsions. They enter the emulsion through the air, water, and plant debris, and make it possible for sulfate-reducing bacteria to cause odor, corrosion, and emulsion breakdown. Elcide 75 controls a much wider range of these and other types of damaging bacteria.

WHAT ELCIDE 75 MEANS TO THE METALWORKING INDUSTRY...

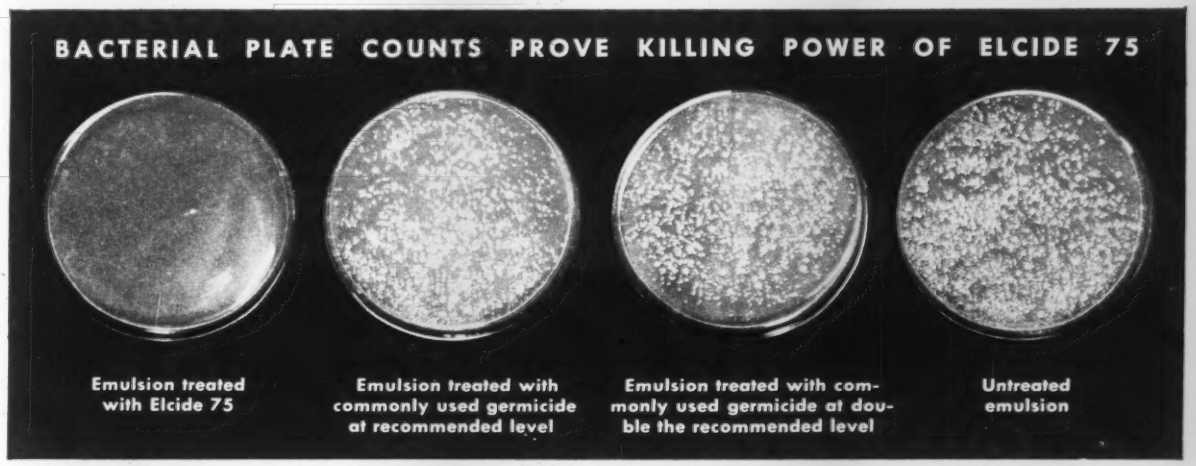
Operating costs can be greatly reduced because of Elcide 75. This saving is an accumulation of several important benefits.

Actual shop tests have shown that one ounce of Elcide 75 added to each four gallons of emulsion can keep the oil-water emulsion fresh as much as 5½ times longer. In one test, emulsions that normally had to be dumped at the end of four weeks ran for 22 weeks when treated with Elcide 75!

You can benefit by three direct savings—costly labor and down time for recharging will be reduced, your soluble oil requirements will drop, and the disposal cost of spoiled emulsions will diminish.

Elcide 75 also contributes to better products and longer machine tool life because it controls the bacteria which often cause acidic corrosion.

You can have a cleaner plant by using Elcide 75. It eliminates objectionable odors as well as bacteria that may cause skin infection. Elcide 75 is nontoxic and safe to use, as proved by tests conducted under normal shop conditions.



The photographs shown above illustrate the broad, powerful anti-bacterial action of Elcide 75. The light areas are bacterial colonies that have grown in three of the emulsion samples during 8 weeks' use. Note that none of these harmful bacteria appear in the emulsion treated with Elcide 75 during the same 8-week period. The emulsion stayed fresh.

PUT ELCIDE 75 TO WORK FOR YOU

The best way to determine the value of Elcide 75 to your own operation is to try it under normal plant conditions, using your regular oil-water emulsion. After you compare the costs of operation, you will agree that Elcide 75 is a valuable discovery that deserves a permanent place in your plant. Why not try Elcide 75 soon?

ELCIDE 75™
PATENT PENDING
Lilly

PRODUCT SPECIFICATIONS
ELCIDE 75

(Lilly's brand of bacterial inhibitor for cutting fluids)

Active Ingredients—Sodium Ethylmercuri Thiosalicylate (Thimerosal) and Sodium *o*-phenylphenate.

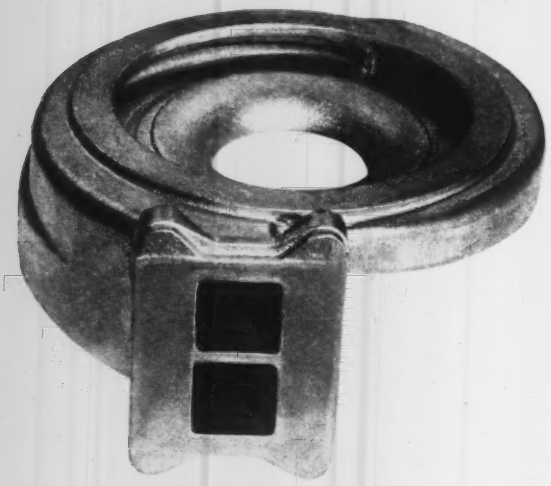
Package	Price per Gal.
1-gallon polyethylene	$8.50
5-gallon polyethylene	$8.00
55-gallon stainless steel	$6.50

This product is sold only through selected distributors.

For further information or to place your order, write or phone:

ELI LILLY AND COMPANY, AGRICULTURAL AND INDUSTRIAL PRODUCTS DIVISION, INDIANAPOLIS 6, INDIANA
TELEPHONE: MElrose 6-2211

Visit us at Booth No. 2101 at the NATIONAL METAL EXPOSITION · Cleveland, Ohio · October 27 to 31



SAVE WHEN THE HEAT IS ON

This 20 pound Ni-Resist casting made for the Schwitzer Corporation by Hamilton Foundry is the turbine casing of a diesel engine turbocharger. Exhaust gases which turn the impeller at speeds up to 90,000 rpm subject the housing to rapid cyclic temperature changes up to 1500° F. Any free scale formed at these temperatures could erode and eventually destroy the impeller blades. Ni-Resist was chosen for this part because it produces practically no free scale, it resists growth and oxidation at high temperatures, and it resists cracking under thermal shock.

Unit production costs are lowered by finding and using the most efficient material available. In this case, Ni-Resist castings combine design flexibility and machinability with long service life under severe temperature stresses. Ni-Resist castings from Hamilton Foundry have dimensional accuracy, uniform machinability, fine surface finish, a low rejection rate, and are delivered on schedule—a combination of factors which lower unit costs and insure Schwitzer's reputation for product quality.

When new and unusual design problems arise in the selection of metal and the casting of parts, you will find that the skill and integrity of your foundry is your best insurance that specifications—and delivery schedules—will be met.

GRAY IRON • ALLOYED IRON • MEEHANITE ® • DUCTILE (NODULAR) IRON • NI-RESIST • DUCTILE NI-RESIST • NI-HARD

HAMILTON FOUNDRY

The Hamilton Foundry & Machine Co., 1551 Lincoln Ave., Hamilton, Ohio • TW 5-7491

ASM PROGRAM . . .

2 p.m.

Statler-Hilton, Ballroom

Presiding Officer: R. L. Smith, Franklin Institute Laboratories.

Magnetic Measurements in Metallurgy—J. E. Goldman, Ford Motor Co.

Magnetic Annealing—C. D. Graham Jr., General Electric Research Laboratories.

Metallurgical Structure and Magnetic Properties—J. J. Becker, General Electric Research Laboratories.

TECHNICAL PAPERS

Monday, Oct. 27—9 a.m.

Statler-Hilton, Euclid Ballroom

PRECIPITATION

Presiding Officers: H. Y. Hunsicker, Aluminum Co. of America; T. E. Leontis, Dow Chemical Co.

Unique Deformation and Aging Characteristics of Certain Magnesium-Base Alloys—S. L. Couling, J. F. Pashak, and L. Sturkey, Dow Chemical Co.

Phenomenon of "Negative Creep" in Alloys—R. W. Fountain and M. Korchynsky, Electro Metallurgical Co.

Aging Characteristics of Hastelloy B—R. E. Clausing, P. Patriarca, and W. D. Manly, Oak Ridge National Laboratory.

Response of an Iron-Base Alloy, Hardened with Titanium, to Various Aging Times and Temperatures—T. W. Eichelberger, Westinghouse Electric Corp.

9 a.m.

Statler-Hilton, Grand Ballroom

DIFFUSION AND GROWTH

Presiding Officers: J. E. Dorn, University of California; W. C. Winegard, University of Toronto.

Preparation of FeO, NiO, and CoO Crystals by Halide Decomposition—R. E. Cech and E. I. Alessandrini, General Electric Co.

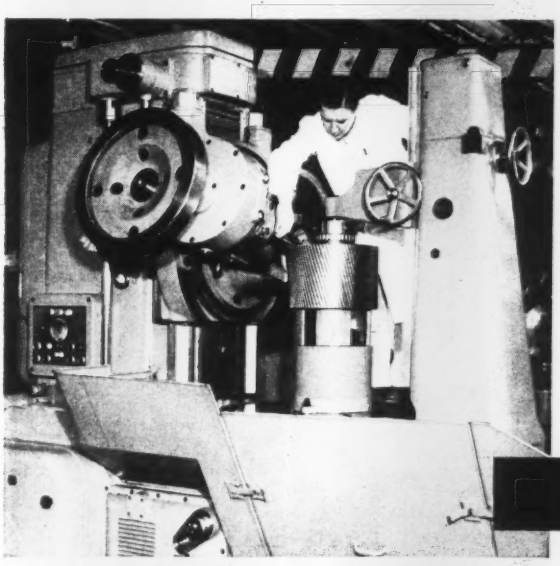
Spiral Growth During Vapor Decomposition of Cadmium — W. I. Pollock, E. I. du Pont de Nemours & Co., and R. F. Mehl, Carnegie Institute of Technology.

Solid State Diffusion and the Motion of Phase Boundaries—D. D. Van Horn, General Electric Co.

Diffusion Layer Formation in the Ternary System Aluminum - Magnesium - Zinc—J. B. Clark, Dow Chemical Co., and F. N. Rhines, Carnegie Institute of Technology.

Growth Conditions for Equi-Axed Crystals in Aluminum-Magnesium Alloys—T. S. Plaskett and W. C. Winegard, University of Toronto.

(*Please turn to Page* 206)



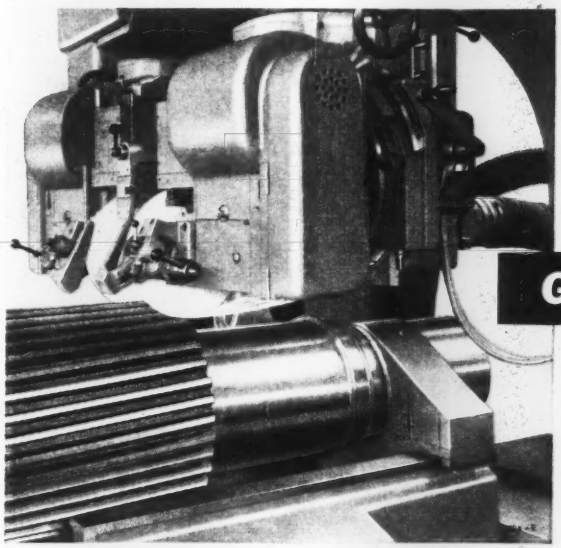
MOST MODERN MACHINERY ASSURES

ACCURACY

Philadelphia Gears are **made right,** then **carefully tested,** and finally **thoroughly inspected** . . . all of these operations are conducted by experienced craftsmen, using the very latest methods and equipment . . . in 4 modern plants.

Send for latest 76 page "Gear Book", G-127.

MADE ACCURATELY



GROUND ACCURATELY

CHECKED FOR ACCURACY

phillie gear®

PHILADELPHIA GEAR CORPORATION

ERIE AVE. & G STREET, PHILADELPHIA 34, PENNA.

Offices in all Principal Cities

metals ... ...to match man's imagination

Conventional metals can no longer provide the solution to design, construction and performance problems confronting the aviation and missile industries, among others. That's why metallurgists and technicians in Wallingford's all-new laboratories are constantly researching metals that will keep pace with the imaginativeness of designers and engineers.

Now, Wallingford can deliver, *from available stock*, many of these stainless steels and super metals with special characteristics and properties:

SUPER ALLOYS

A 286 AM 350 AM 355
M 252 N 155 R 235 V 36
Rene 41 Zirconium (vacuum annealed)
Haynes 25 Hastelloy B, C and X
19-9 DL

FACILITIES FOR WIDTHS UP TO 27" — THICKNESSES DOWN TO .001 — EXTREMELY CLOSE TOLERANCES MAINTAINED.

Whatever your requirements, Wallingford can help you. Write to The Wallingford Steel Co., Wallingford, Conn.

THE WALLINGFORD STEEL CO.

Progress in Metals for over 36 Years

WALLINGFORD, CONN., U.S.A.

COLD ROLLED STRIP: *Super Metals, Stainless, Alloy*
WELDED TUBES AND PIPE: *Super Metals, Stainless, Alloy*

ASM PROGRAM . . .

2 p.m.
Statler-Hilton, Grand Ballroom
HIGH-TEMPERATURE METALS

Presiding Officers: J. H. Bechtold, Westinghouse Electric Corp.; W. D. Manly, Oak Ridge National Laboratory.

An X-Ray Metallographic Study of Arc-Cast Tungsten—S. Leber, General Electric Co.

Temperature and Stress Dependence of the Atmosphere Effect on a Nickel-Chromium Alloy—P. Shahinian and M. R. Achter, U. S. Naval Research Laboratory.

Studies of the Oxidation and Contamination Resistance of Binary Columbium Alloys—C. T. Sims, W. D. Klopp, and R. I. Jaffee, Battelle Memorial Institute.

Tuesday, Oct. 28—9 a.m.
Statler-Hilton, Grand Ballroom
STEEL—I

Presiding Officers: G. H. Enzian, Jones & Laughlin Steel Corp.; S. L. Gertsman, Department of Mines & Technical Surveys, Ottawa.

Mechanical Properties of Fe-Al-Si Alloys at Room and Elevated Temperatures—D. J. Schmatz and V. F. Zackay, Ford Motor Co.

Recrystallization, Structure, and Hardness of Low-Carbon Steels Containing up to 1% Copper—R. L. Rickett and W. C. Leslie, U. S. Steel Corp.

Multiplying Factors for the Calculation of Hardenability of Hypereutectoid Steels Hardened from 1700° F—C. F. Jatczak and D. J. Girardi, Timken Roller Bearing Co.

Effect of Copper on the Heat Treating Characteristics of Medium-Carbon Steel — R. A. Grange, U. S. Steel Corp.; V. E. Lambert, Westinghouse Electric Corp., and J. J. Harrington, U. S. Steel Corp.

9 a.m.
Statler-Hilton, Ohio Room
MECHANICAL PROPERTIES

Presiding Officers: R. D. Chapman, Chrysler Corp.; W. T. Lankford, U. S. Steel Corp.

Relationship Between Weld-Cracking and Alloy Constitution in Some Binary and Ternary Magnesium Alloys—C. L. Kobrin and R. A. Dodd, University of Pennsylvania.

Stress Effects of Abrasive Tumbling — H. R. Letner, General Electric Co.

Thermal and Mechanical Fatigue of Nickel and Titanium—Harry Majors Jr., Seattle University.

A Compilation and Interpretation of Cyclic Strain Fatigue Tests on Metals—J. F. Tavernelli and L. F. Coffin Jr., General Electric Co.

(*Please turn to Page* 209)

Inspection of 75-foot Salem Rotary Hearth Furnace at The Timken Roller Bearing Company plant at Canton, Ohio.

Rotary hearth roof of B&W IFB gives nine years of service at the Timken Company

Installed as a replacement for a super-duty firebrick sprung arch, over 35,000 B&W Insulating Firebrick were used in the roof of this rotary hearth furnace. Since installation nine years ago, just 300 9″ equivalents have been used for maintenance—less than 1% replacement!

Throughout this period the furnace has been operated at temperatures ranging from 2100 F to 2300 F on a continuous 6-day cycle at an average output of 20 tons per hour.

In addition to long service life, lightweight B&W Insulating Firebrick provide high fuel savings because of their low heat flow and heat storage. Lightweight IFB also simplify original furnace construction...make maintenance and patching easier.

For more information on long-lasting, cost cutting B&W Insulating Firebrick, consult your B&W Refractories Representative or send for Bulletin R-2-H.

BABCOCK & WILCOX

THE BABCOCK & WILCOX CO.
REFRACTORIES DIVISION
GENERAL OFFICES: 161 EAST 42nd ST., NEW YORK 17, N.Y.
WORKS: AUGUSTA, GA.

B&W REFRACTORIES PRODUCTS:
B&W Allmul Firebrick • B&W 80 Firebrick • B&W Junior Firebrick
B&W Insulating Firebrick • B&W Refractory Castables, Plastics and Mortars • B&W Silicon Carbide • B&W Ramming Mixes • B&W Kaowool

R-598

Greenlee Transfer Machines can be Reworked to meet Product Changes

The Greenlee "Rearrangeable Unit" concept of transfer machine design is becoming increasingly popular in mass production manufacturing. These machines accommodate recurring changes in product design. Year after year they guard against costly obsolescence . . . they are changed to meet your changing requirements. Get the complete story from Greenlee.

PRODUCTION MACHINERY
GREENLEE

Write for Complete Information, or Phone Rockford, Ill., 3-4881

GREENLEE STANDARD AND SPECIAL MACHINES AND TOOLS

- Transfer-Type Processing Machines
- Multiple-Spindle Drilling and Tapping Machines
- Six and Four-Spindle Automatic Bar Machines
- Hydro-Borer Precision Boring Machines
- Core Box Rollover and Draw Machines
- Specialized Woodworking Machines
- Hand Tools for Woodworking
- Tools for Woodworking Machines
- Hydraulic Tools for Electricians, Plumbers, Contractors

GREENLEE GUARDS AGAINST COSTLY OBSOLESCENCE

GREENLEE
BROS. & CO.

1930 MASON AVE.
ROCKFORD, ILLINOIS

ASM PROGRAM . . .

2 p.m.
Statler-Hilton, Grand Ballroom
STEEL—II

Presiding Officers: D. J. Girardi, Timken Roller Bearing Co.; O. O. Miller, International Nickel Co.

Mechanism of the Allotropic Transformation in High-Purity Iron—E. Eichen and J. W. Spretnak, Ohio State University.

Mechanical Properties of Deformed Metastable Austenitic Ultra-High Strength Steel—D. J. Schmatz and V. F. Zackay, Ford Motor Co.

Austenite Transformation and Incubation in an Alloy Steel of Eutectoid Carbon Content—R. A. Grange, P. T. Kilhefner Jr., and T. P. Bittner, U. S. Steel Corp.

Magnetic Analysis of Phase Changes Produced in Tempering a High-Carbon Steel—M. Mentser, Bureau of Mines, Department of the Interior.

A Simplified Procedure for Calculating Peak Position in X-Ray Residual Stress Measurements on Hardened Steel—D. P. Koistinen and R. E. Marburger, General Motors Corp.

Wednesday, Oct. 29—2 p.m.

Statler-Hilton, Grand Ballroom
BRITTLE FRACTURE

Presiding Officers: M. Cohen, Massachusetts Institute of Technology; J. F. Libsch, Lehigh University.

Cleavage Step Formation in Brittle Fracture Propagation—J. M. Berry, General Electric Co.

Low-Temperature Embrittlement of Austenitic Cr-Mn-N-Fe Alloys — F. W. Schaller, Case Institute of Technology, and V. F. Zackay, Ford Motor Co.

Transition Temperature in a Notched Bar Impact Test—J. A. Hendrickson, California Research Corp.; D. S. Wood and D. S. Clark, California Institute of Technology.

Effect of Grain Size and Carbon Content on the Yield Delay Time of Mild Steel—J. M. Krafft and A. M. Sullivan, U. S. Naval Research Laboratory.

Some Low-Temperature Observations of 1020 Steel—F. S. Deronja and M. Gensamer, Columbia University.

Statler-Hilton, Euclid Ballroom
URANIUM

Presiding Officers: E. C. Miller, Oak Ridge National Laboratory; J. F. Schumar, Argonne National Laboratory.

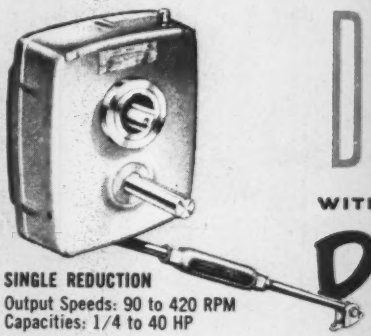
Transformation Kinetics of Beta Plutonium—R. D. Nelson, General Electric Co.

Transformation Characteristics of Dilute Ternary Alloys of Uranium—D. J.

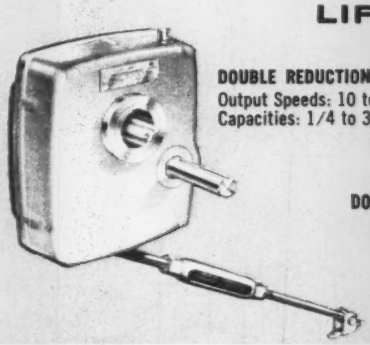
(*Please turn to Page 212*)

NOW AVAILABLE FROM STOCK

FOOTE BROS. SHAFT MOUNTED DRIVES WITH Duti-Rated® LIFETIME GEARING*

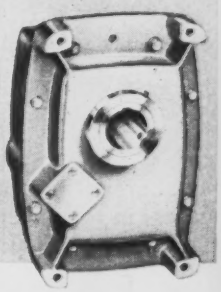


SINGLE REDUCTION
Output Speeds: 90 to 420 RPM
Capacities: 1/4 to 40 HP



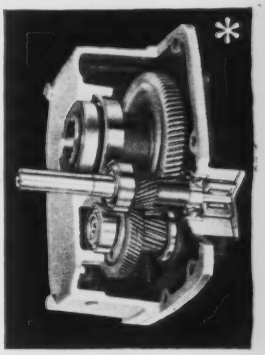
DOUBLE REDUCTION
Output Speeds: 10 to 160 RPM
Capacities: 1/4 to 30 HP

DOUBLE REDUCTION FLANGE MOUNT
Output Speeds: 10 to 135 RPM
Capacities: 1 to 7 HP



Foote Bros. Shaft Mounted Drives offer more efficient, more economical, power transmission. They incorporate exclusive Duti-Rated Lifetime Gearing — the high hardness, balanced design, premium quality gearing that combines greater load carrying capacity with long service life.

Used with standard V-Belts and Sheaves, Foote Bros. Shaft Mounted Drives will provide virtually any output speed you may require. Quick, easy installation on driven shafts with diameters from 15/16" to 3-7/16" saves time, labor . . . eliminates need for reducer mounting, couplings, and adjustable motor mount. Built-in Backstop to prevent reverse rotation, Automatic Overload Release Torque Arm, Variable Pulley, are available as optional equipment.



The complete Foote Bros. Shaft Mounted Drive line is made in accordance with all applicable AGMA Standards.

Write for NEW SHAFT MOUNTED DRIVE CATALOG

This Trademark Stands for the Finest Industrial Gearing Made

T.M. REG. U.S. PATENT OFFICE

FOOTE BROS.
Better Power Transmission Through Better Gears

FOOTE BROS. GEAR AND MACHINE CORPORATION
4583 S. Western Boulevard • Chicago 9, Illinois

"BREAKTHROUGH"—"DYNAPAK"

SYNONYMS IN ADVANCED METAL WORKING

Metallurgists and tool engineers have achieved success in their search for a versatile, practical machine for extruding, forming, and forging tomorrow's high-strength metals and alloys.

A breakthrough was at hand when it was discovered that many of these metals exhibit hydrodynamic behavior when they are worked at very high velocities, with high rates of energy application.

For example, where an extrusion process normally is performed at velocities of 1 to 5 fps and at pressures to 175,000 psi, high energy extrusion takes place at velocities to 200 fps and at pressures of 250,000 psi and above.

While the phenomena of high energy forming characteristics of metals are not yet fully understood, it is known that metals so formed exhibit increased flow with little or no spring back.

But the real breakthrough could not occur until science had perfected machines that could generate these velocities and pressures in a safe and practical manner, to produce end-products of high physical and dimensional integrity.

SUCH A BREAKTHROUGH IS DYNAPAK.

DYNAPAK

DYNAPAK is a pneumatically energized machine that develops velocities to 500 fps and controls them to ±½ fps... **DYNAPAK** is a versatile multi-purpose machine that can forge, extrude, or form, and can be readily converted from one process to another...**DYNAPAK** develops 40,000 foot-pounds of energy in a 6 inch machine that is less than 2 feet square and 10 feet long, weighs 3000 pounds and can literally be bench mounted. A 36 inch **DYNAPAK** generates 1,500,000 foot pounds of energy...**DYNAPAK** is attractively packaged—can be utilized in clean manufacturing areas...**DYNAPAK** produces parts that can not be produced in any other way, because the extremely high pressures literally force metal into every crevice of the die. **DYNAPAK** extrudes web thicknesses to one-hundredth of an inch—forges to zero draft angle—produces exceptionally good surface finishes...**DYNAPAK** is equally applicable with today's materials and production problems, and involves extremely low initial investment... **DYNAPAK** is more than a new machine, or a means of implementing a new concept. It is in itself a totally new concept—a new philosophy. **DYNAPAK** IS SAFE (no explosives are used), VERSATILE, PRACTICAL, OPERATIONAL.

SEE

FOR COMPLETE INFORMATION, write, wire or phone

DYNAPAK

CONVAIR A DIVISION OF GENERAL DYNAMICS CORPORATION

1243 Transit Avenue, Pomona, California • Phone: NA. 9-1109

How to Sidestep Obsolescence

By upgrading plant equipment now, while demand is low, you can sidestep future obsolescence and be ready for tomorrow's production peaks. An important part of this program can be General Electric's new packaged, adjustable-speed drive—the Speed Variator.

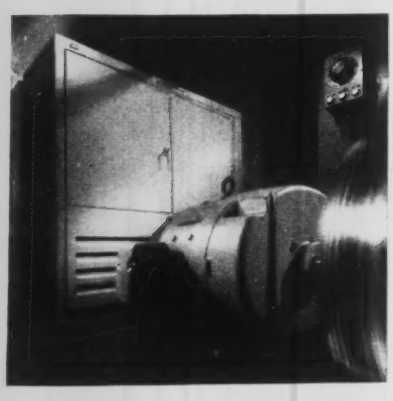
Because of its wide speed range and precise regulation, it is ideal for modern, high-speed production. For example, in processing lines, rolling and tube mills, the Speed Variator maintains speeds automatically, accelerates and decelerates smoothly, controls tensions accurately.

New Amplistat Regulator and Static Exciter, standard on all new G-E Speed Variators, have no moving parts. As a result, maintenance costs are reduced.

To find out how the Speed Variator can help you obtain maximum drive flexibility, call your General Electric Sales Engineer, or write for GEA-6643. *Direct Current Motor & Generator Department, Erie, Pa.*
813-19

Progress Is Our Most Important Product

GENERAL ELECTRIC



ASM PROGRAM . . .

Murphy, University of Arizona.

Mechanical Properties and Heat Treatment Response of Zirconium-Uranium Alloys—W. Chubb and F. A. Rough, Battelle Memorial Institute.

Preparation of Uranium and Uranium Alloy Powder Metal Compacts—Herbert S. Kalish, Sylvania-Corning Nuclear Corp.

Properties of As-Cast and Heat Treated 2% Molybdenum-Uranium—E. G. Zukas, Los Alamos Scientific Laboratory.

Thursday, Oct. 30—9 a.m.

Statler-Hilton, Euclid Ballroom

TITANIUM—I

Presiding Officers: W. R. Opie, National Lead Co.; W. Rostoker, Armour Research Foundation.

Application of Rate Process Theory to the Heat Treatment of Titanium Alloys—N. M. Erkun, Crucible Steel Co. of America.

Effects of Microstructure and Heat Treatment on the Hydrogen Embrittlement of Alpha-Beta Titanium Alloys—D. N. Williams, F. R. Schwartzberg, and R. I. Jaffee, Battelle Memorial Institute.

Effect of Composition on the Hydrogen Embrittlement of Alpha-Beta Titanium Alloys—R. I. Jaffee and D. N. Williams, Battelle Memorial Institute.

Hydrogen Embrittlement and Delayed Failure in Titanium Alloys—R. D. Daniels, University of Oklahoma; R. J. Quigg and A. R. Troiano, Case Institute of Technology.

Corrosion Pyrophoricity and Stress Corrosion Cracking of Titanium Alloys in Fuming Nitric Acid—J. B. Rittenhouse, California Institute of Technology.

Statler-Hilton, Grand Ballroom

CREEP

Presiding Officers: R. W. Guard, General Electric Co.; W. A. Reich, General Electric Co.

Activation Energies for Creep of Polycrystalline Copper and Nickel—P. R. Landon, J. L. Lytton, L. A. Shepard, and J. E. Dorn, University of California.

A Procedure for Application of Time-Temperature Parameters to Accelerated Creep Rupture Testing—S. S. Manson, G. Succop, and W. F. Brown Jr., NACA.

Effect of Strain Rate and Temperature on the Compressive Flow Stresses of Three Titanium Alloys—A. J. Griest, A. M. Sabroff, and P. D. Frost, Battelle Memorial Institute.

Temperature and Rate Dependence of Strain Hardening in the Aluminum Alloy 2024-0—D. S. Fields Jr., Aluminum Co. of America and W. A. Backofen, Massachusetts Institute of Technology.

2 p.m.

Statler-Hilton, Euclid Ballroom

TITANIUM—II

Presiding Officers: E. M. Mahla, E. I. du Pont de Nemours & Co.; P. G. Nelson, Budd Co.

Microstructure and Mechanical Properties of Ti-Cu-Al and Ti-Cu-Al-Sn Alloys—R. F. Bunshah and H. Margolin, New York University.

Effect of Heat Treatment on the Elevated Temperature Stress Stability of Titanium Alloys—M. L. Greenlee, G. A. Lenning, W. M. Parris, and H. D. Kessler, Titanium Metals Corp. of America.

Influence of Forging Temperature in Mechanical Properties of Al-V-Ti Alloys—L. S. Coran and F. J. Rizzitano, Watertown Arsenal Laboratories.

A Contribution to the Hardenability Problem in Titanium Alloys—R. P. Elliott and W. Rostoker, Armour Research Foundation.

Effect of Stress on the Eutectoid Decomposition of Titanium-Chromium Alloys—A. W. Goldenstein, A. G. Metcalfe, and W. Rostoker, Armour Research Foundation.

William Park Woodside
Panel Conferences

Monday, Oct. 27—9 a.m.

Hotel Cleveland, Cleveland Room

FABRICATION OF MOLYBDENUM—I

Chairman: A. J. Levy, Marquardt Aircraft Co.

Molybdenum as a Structural Alloy—J. J. Harwood, Office of Naval Research.

Production of Quality Molybdenum Mill Products—W. L. Bruckart, Universal Cyclops Steel Corp.

Forming Molybdenum Sheets — D. C. Goldberg, Westinghouse Electric Corp.

2 p.m.

Hotel Cleveland, Cleveland Room

FABRICATION OF MOLYBDENUM—II

Chairman: G. A. Timmons, Climax Molybdenum Co. of Michigan.

Fusion Welding Molybdenum — D. C. Martin, Battelle Memorial Institute.

Brazing Molybdenum—G. S. Hoppin III, General Electric Co.

Machining of Molybdenum—W. A. Taebel and J. Gelok, Westinghouse Electric Corp.

Protective Coating Systems for Molybdenum—R. I. Jaffee, Battelle Memorial Institute.

(*Please turn to Page 215*)

5 REASONS WHY YOU SHOULD BUY—

New General Electric Speed Variator

1. Amplistat Regulator offers better speed regulation and adjustable, timed acceleration for improved product quality.

2. Static Exciter, with silicon rectifier, has no moving parts, requires no warm-up, provides more production time, less maintenance.

3. Two-Unit, Four-Bearing M-G Set features Tri-Clad† '55' motor for more dependable performance.

4. Front-Connected Controls, recessed wiring troughs make routine inspection easy, cut maintenance time.

5. Kinamatic* Drive-Motors have field coils encapsulated for longer life. For details on this dependable motor see next page.

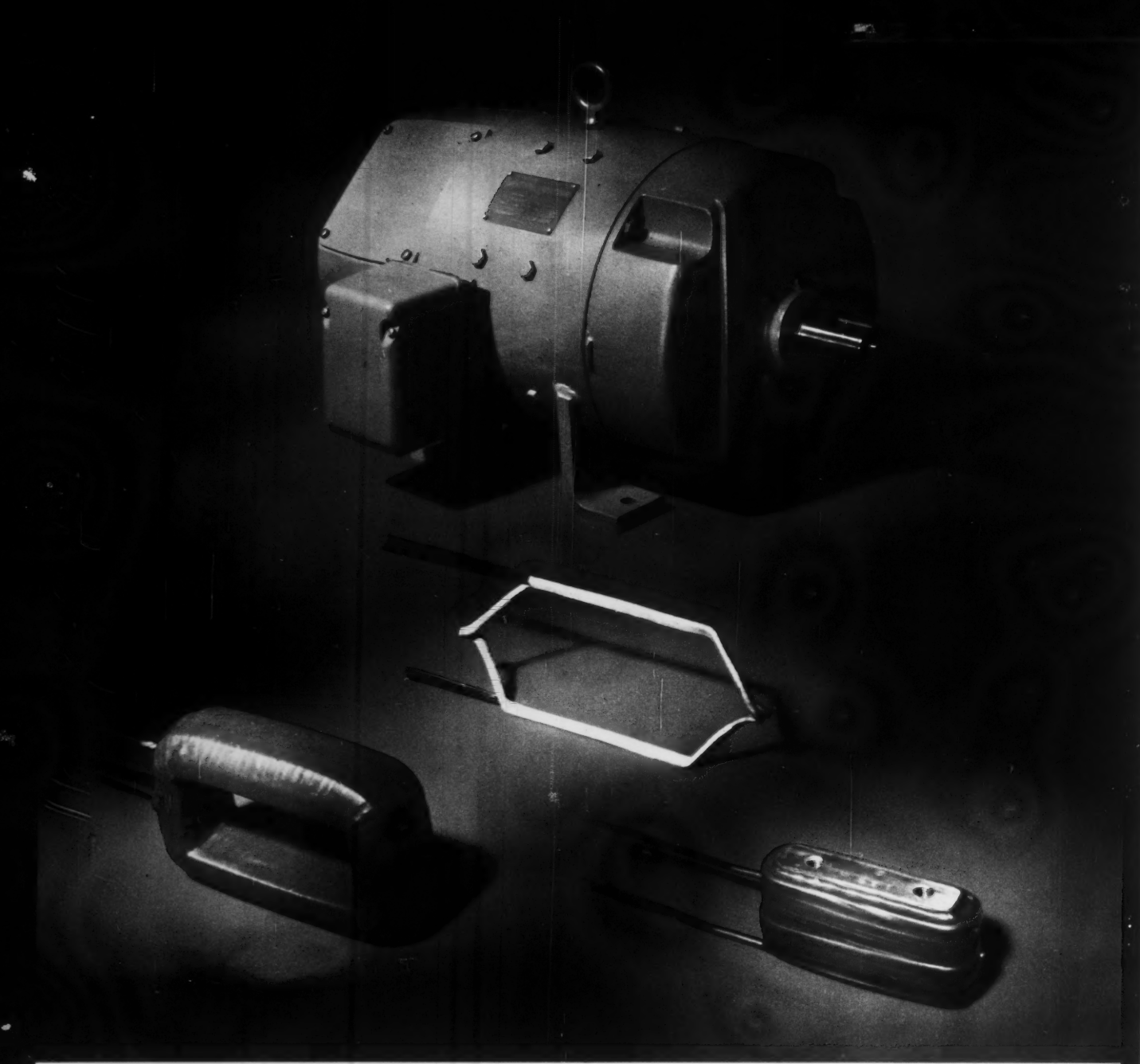
For more information contact your Apparatus Sales Office or write for GEA-6643. *Direct Current Motor & Generator Department, Erie, Pennsylvania.*

In Canada, contact Canadian General Electric, Peterborough, Ontario.

† Registered Trade Mark General Electric Co.
* Trade-Mark of the General Electric Co. 813-12

GENERAL ELECTRIC

More On Kinamatic Motors



NEW GENERAL ELECTRIC DC MOTOR HAS

Coils Encapsulated for Longer Life

KINAMATIC* . . . *a new standard in industrial direct-current motors* . . . designed to give extra dependability to automated production systems.

Encapsulated Field Coils . . . insulated with mica and glass and permanently sealed against moisture and corrosive airborne materials . . . virtually eliminates insulation as an element in motor life and adds a reliability factor never before available in a standard direct-current motor.

Greater Versatility . . . a 15% service factor now available in the standard, dripproof d-c Kinamatic motor means user can: 1) obtain 15% more than rated power for normal life of motor; 2) obtain 100% longer motor life at rated power; or, 3) obtain greater versatility on speed and horsepower duty cycles.

Additional information is available at your nearest General Electric Apparatus Sales Office. Or, write for Bulletin GEA-6355. *Direct Current Motor and Generator Department, General Electric Company, Erie, Pennsylvania.*

*Trade-Mark of General Electric Company. 813-12

Progress Is Our Most Important Product

GENERAL ELECTRIC

ASM PROGRAM . . .

Tuesday, Oct. 28—9 a.m.

Hotel Cleveland, Wedgewood Room

QUENCHING OF STEELS—I

Chairman: O. W. McMullan, Federal-Mogul-Bower Bearings Inc.

How and Why of Quenching — C. A. Siebert, University of Michigan.

Quenching, Thermal Process—V. Paschkis and G. Stolz Jr., Columbia University.

Evaluation of Quenching Media—G. H. Robinson and H. J. Gilliland, General Motors Corp.

Hotel Cleveland, Cleveland Room

PRECISION MECHANICAL SPRINGS—DESIGN AND PERFORMANCE

Chairman: George F. Meyer, International Harvester Co.

Types of Springs in General Use—J. B. Beckwith, Associated Spring Corp.

Role of Stress in Spring Performance—A. M. Wahl, Westinghouse Electric Corp.

Behavior of Springs at Elevated Temperatures—W. R. Johnson, Associated Spring Corp.

Spring Materials—Lem Kulze, Associated Spring Corp.

2 p.m.

Hotel Cleveland, Wedgewood Room

QUENCHING OF STEELS—II

Chairman: T. A. Frischman, Eaton Mfg. Co.

Hot Quenching—William Hiatt, International Harvester Co.

Basis of Selection of Quenching Media—R. H. Lauderdale, Northern Ordnance Inc.

Automatic Quenching Equipment—O. E. Cullen, Surface Combustion Corp.

Wednesday, Oct. 29—9 a.m.

Hotel Cleveland, Wedgewood Room

MODERN MACHINING METHODS—I

Chairman: To be announced.

New Cutting Tool Materials—R. T. Hook, Warner & Swasey Co.

Constant Speed Machining—M. C. Shaw, Massachusetts Institute of Technology.

Quick Change, Preset Tooling—A. S. Rogers, Wesson Co.

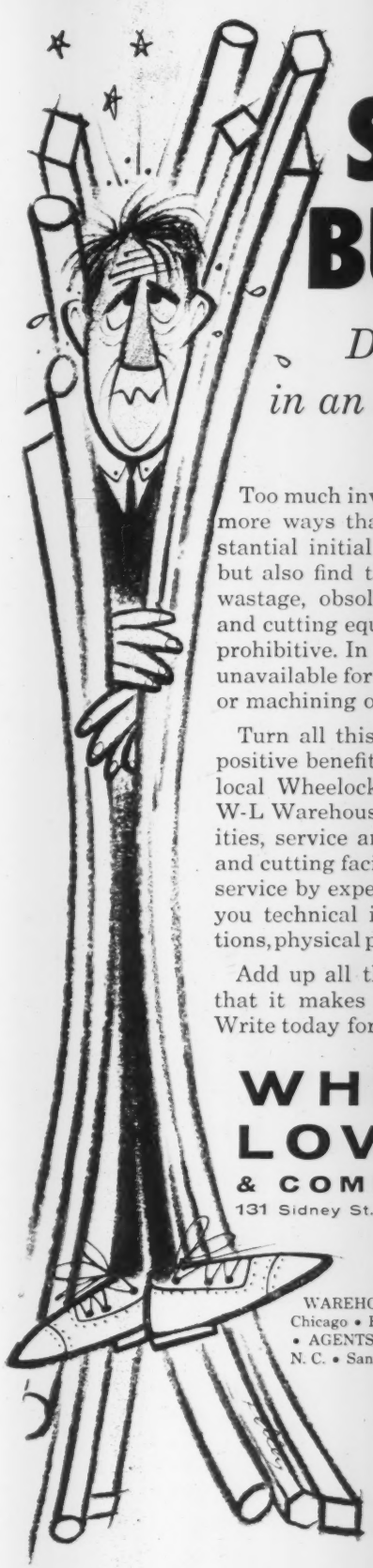
2 p.m.

Hotel Cleveland, Wedgewood Room

MODERN MACHINING METHODS—II

Chairman: F. W. Boulger, Battelle Memorial Institute.

Trends in High-Speed Equipment—M. S. Curtis, Warner & Swasey Co.



STEEL BUYERS

Don't get caught in an Inventory Squeeze!

Too much inventory can really jam you up, in more ways than one. You not only incur substantial initial costs that tie up your capital, but also find that the costs piled up by scrap, wastage, obsolescence, maintenance, handling and cutting equipment, taxes and insurance are prohibitive. In addition, valuable floor space is unavailable for other uses, such as heat-treating or machining operations.

Turn all this around, and you see the many positive benefits made available to you by your local Wheelock-Lovejoy Steel Service Center. W-L Warehouse Service offers complete facilities, service and stocks . . . complete handling and cutting facilities . . . fast delivery . . . personal service by expert W-L metallurgists who'll give you technical information on grades, applications, physical properties, tests, heat treating, etc.

Add up all the advantages, and you'll agree that it makes good sense to deal with W-L. Write today for Wheelock-Lovejoy Data Sheets.

WHEELOCK, LOVEJOY & COMPANY, INC.

131 Sidney St., Cambridge 39, Mass.

AMERICAN STEEL WAREHOUSE ASS'N

WAREHOUSE SERVICE – Cambridge • Cleveland • Chicago • Hillside, N. J. • Detroit • Buffalo • Cincinnati • AGENTS – Southern Engineering Company, Charlotte, N. C. • Sanderson-Newbould, Ltd., Montreal & Toronto.

DURASPUN

20-FOOT FURNACE ROLLS

Centrifugally Cast

. . . of Duraloy HH Alloy, one of the most widely used high chrome, medium nickel alloys.

Two items concerning these furnace rolls may be of particular interest:

a—the size: 20 feet long—14" OD, ¾" wall thickness

b—*welding operations* by which reducing cones and shafts (both statically cast of the same alloy) were welded to the centrifugally cast rolls

These two items will serve to emphasize two phases of our service: (1) the large size centrifugally cast tubes we are able to produce and (2) our machining and finishing facilities, including welding.

Our new 16-page general Bulletin — 3354-G — gives complete details. Would you like a copy? When writing or calling would you mind telling us the general nature of your high alloy casting requirements? Better yet, if you have specific requirements on which we could help, let us have the details.

The DURALOY Company

OFFICE AND PLANT: Scottdale, Pa.

EASTERN OFFICE: 12 East 41st Street, New York 17, N. Y.
ATLANTA OFFICE: 76—4th Street, N.W.
CHICAGO OFFICE: 332 South Michigan Avenue
DETROIT OFFICE: 23906 Woodward Avenue, Pleasant Ridge, Mich.

ASM PROGRAM . . .

Chipless Machining—R. D. Halverstadt and R. Cogan, General Electric Co.

Machining High-Strength Materials — F. G. Fenger and R. W. Runyan, Menasco Mfg. Co.

Machining of Molybdenum—H. J. Siekman and L. A. Sowinski, General Electric Co.

Hotel Cleveland, Whitehall Room

DESIGN AND SPECIFICATION FOR HIGH-QUALITY CASTINGS

Chairman: To be announced.

Aircraft and Missiles—Mrs. Rebecca H. Sparling, Convair.

Petroleum Refining Industry—N. J. Rees and R. W. Manuel, Socony Mobil Oil Co. Inc.

Railroads—W. R. Elsey, Pennsylvania Railroad Co.

Machine Tools—Herbert Whitney, Kearney & Trecker Corp.

Thursday, Oct. 30—9 a.m.

Hotel Cleveland, Whitehall Room

METALS AND FABRICATION METHODS FOR HIGH-PRESSURE APPLICATIONS

Chairman: To be announced.

Special Materials Problems in High-Pressure Applications — Donald S. Nulk, Thompson Products Inc.

Ultra-High Strength Pressure Vessels in the Missiles Field—W. S. Tenner, Aerojet-General Corp.

New Welding Techniques in Pressure Vessels—R. E. Lorentz Jr., C. T. Ward, and W. B. Bunn, Combustion Engineering Inc.

Heat Treatment of Weldments, to be announced.

Hotel Cleveland, Wedgewood Room

HIGH-VELOCITY FORMING

Chairman: John Dorn, University of California.

High-Energy Rate Forming by Machine—J. B. Ottestad, Convair.

Explosive Forming under Water—E. W. Feddersen, Convair.

Explosive Forming by Direct Application—A. H. Petersen, Lockheed Aircraft Corp.

2 p.m.

Hotel Cleveland, Wedgewood Room

THE METALLURGIST LOOKS AT NONMETALLIC MATERIALS

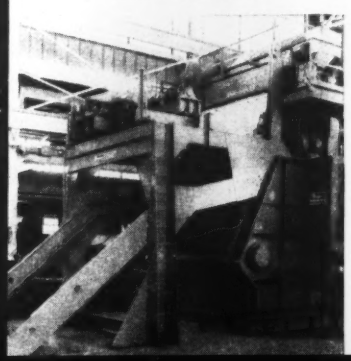
Chairman: To be announced.

Plastics—K. F. Charter, A. O. Smith Corp.

When this door comes down . . . so does your blast cleaning cost!

Abrasive-tight door on Rotoblast Barrel slashes "lost abrasive" costs

Pangborn Rotoblast Barrel for efficient batch cleaning. Available in 1½, 3, 6, 12, 18, 20, 32, 72 and 102 cubic foot sizes.



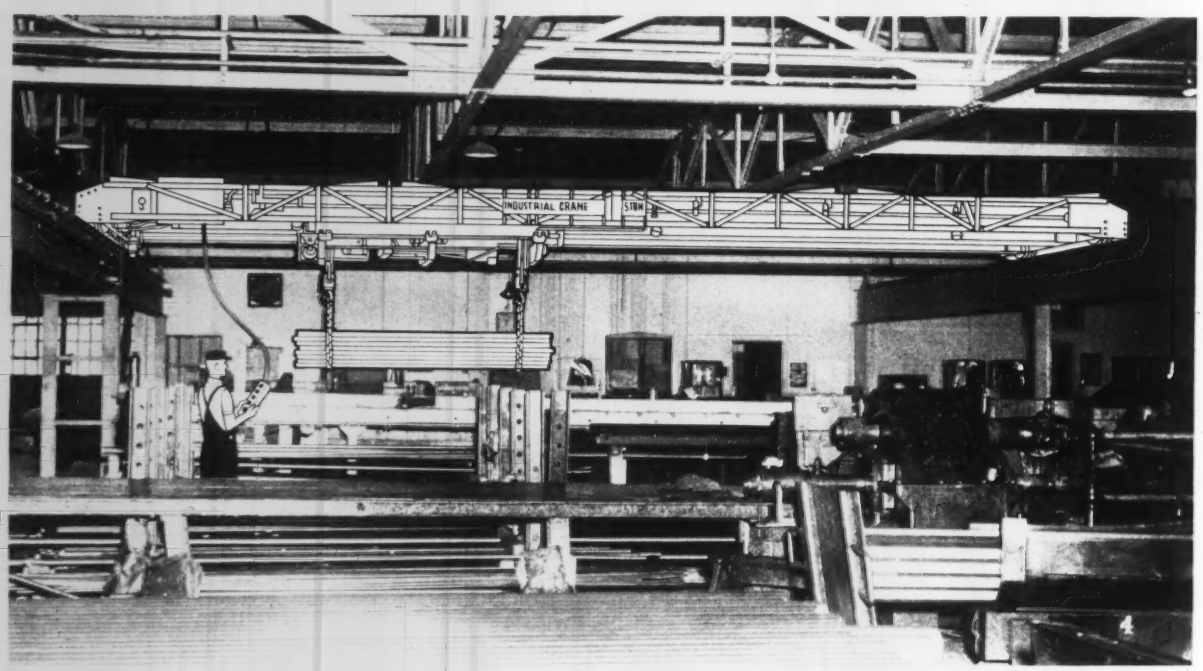
Look at it. That door on the Pangborn Rotoblast Barrel is engineered to prevent waste. Heavy steel plates . . . an exclusive arrangement that permits raising the door for easy maintenance . . . *clamp*-closing to make it really abrasive-tight! As a result, here is another way that Pangborn Rotoblast Barrels save you money.

This door is just one of the many benefits built into Rotoblast Barrels. Efficient Rotoblast operation, for example. Automatic control. Ease of maintenance. Plus specific construction features that all add up to *better* cleaning in *less* time for *lowest* cost per ton.

The Pangborn Engineer in your area will be glad to take off his coat and go to work on your cleaning problem at no obligation. And for complete information on Rotoblast Barrels, write to: Pangborn Corp., *1600 Pangborn Blvd., Hagerstown, Md. Manufacturers of Blast Cleaning & Dust Control Equipment.*

Clean it fast with **Pangborn ROTOBLAST®**

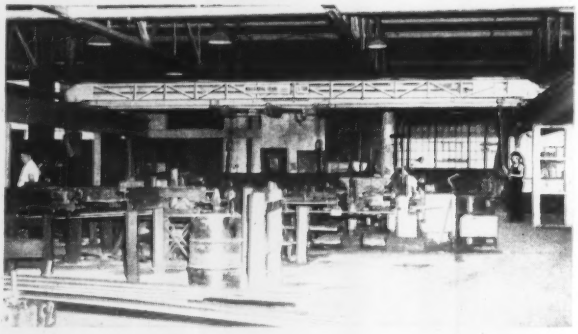
Cuts handling costs 80% with 2 cranes by Borg-Warner® INDUSTRIAL CRANES



efficient handling, better housekeeping make big savings

Inefficient materials handling methods can eat up profits in a hurry! This plant installed two 5-ton top running cranes by **Borg-Warner Industrial Cranes.** They found they could handle more cold-rolled steel in and out of storage and during processing with their B-W cranes than they could with former methods. At the same time it cost them only a fifth as much to handle *a greater volume!* Good housekeeping and more efficient handling speed up all departments resulting in a more profitable operation and better service to customers.

Whatever your materials handling problems it will pay you to talk them over with a **Borg-Warner Industrial Cranes** representative.



Two top-running motor-driven cranes

Operating on self-supported runways independent of the roof structure both double-girder cranes are floor operated by push-button control. Each crane is equipped with an underhung double hook trolley especially suited for handling bar stock.

Find Your Nearest Distributor Under CRANES In The Yellow Pages

Distributors in all principal industrial cities.

Design it better . . . Make it better.

Industrial® CRANES

INGERSOLL PRODUCTS®

B-W BORG-WARNER

Borg-Warner® INDUSTRIAL CRANES

1550 S. PAULINA STREET, CHICAGO 8, ILLINOIS

Export Sales: Borg-Warner International, 36 South Wabash Ave., Chicago 3, Illinois

ASM PROGRAM . . .

Ceramics (speaker to be announced.)
Cermets—Malcolm F. Judkins, Firth Sterling Inc.

SEMINAR ON RESIDUAL STRESSES

Seven lectures by Prof. Richard Weck, Cambridge University, England, director of research of the British Welding Research Association.

All Sessions in Wade Park Manor

Thursday, Oct. 30—10 a.m.

I—Definition and Origin.
Commentators: H. R. Neifert, Timken Roller Bearing Co.; J. A. Halgren, International Harvester Co.

1:30 p.m.

II—Measurement of Residual Stresses.
Commentators: E. S. Rowland, Timken Roller Bearing Co.; Ray L. Mattson, General Motors Corp.; George A. Butz, Aluminum Co. of America.

Friday, Oct. 31—10:30 a.m.

III—Influence of Residual Stress on Deformation, Static Strength, and Dimensional Stability.
Commentators: H. J. Noble, Pratt & Whitney Aircraft; E. S. Rowland, Timken Roller Bearing Co.

2 p.m.

IV—Influence of Residual Stress on Fatigue Strength and Stress Corrosion Cracking.
Commentators: Ray L. Mattson, General Motors Corp.; Julius Heuschkel, Westinghouse Electric Corp.; Leo P. Tarasov, Norton Co.

8 p.m.

V—Relation Between Residual Stresses and Brittle Fracture.
Commentators: Julius Heuschkel, Westinghouse Research Laboratories; W. M. Baldwin, Case Institute of Technology.

Saturday, Nov. 1—10:30 a.m.

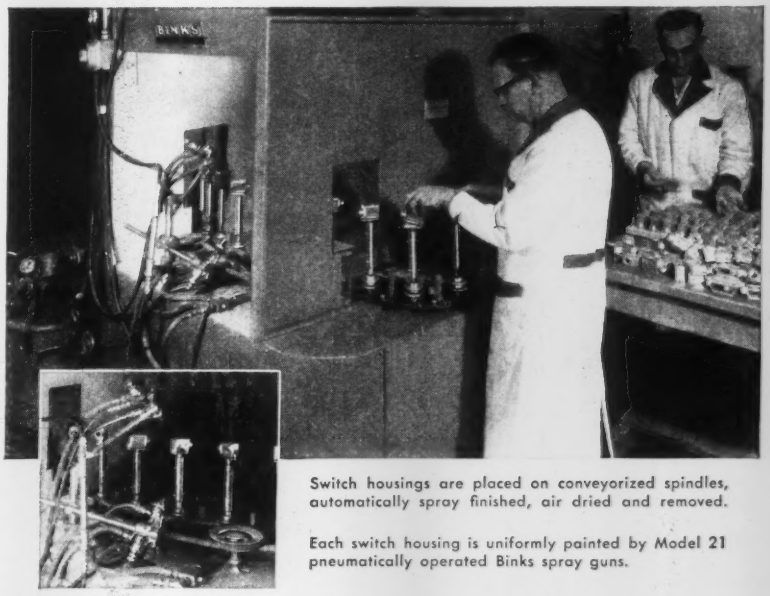
VI—Relation Between Residual Stresses and Brittle Weldments.
Commentators: W. M. Baldwin, Case Institute of Technology; LaMotte Grover, Air Reduction Co.

2 p.m.

VII—Methods for Stress Relieving.
Commentators: L. J. Larson, Allis-Chalmers Co.; George A. Butz, Aluminum Co. of America.

Closure: J. O. Almen, consulting engineer, honorary chairman of the seminar.

(*Please turn to Page 222*)



Switch housings are placed on conveyorized spindles, automatically spray finished, air dried and removed.

Each switch housing is uniformly painted by Model 21 pneumatically operated Binks spray guns.

At MICRO SWITCH...

automatic painting on Binks machine boosts finishing output 400%

"We are now able to paint up to 945 switch housings an hour," reports Mr. Walter Gage, finishing foreman for the MICRO SWITCH division of Minneapolis Honeywell Regulator Company, Freeport, Ill. "This is four times our previous hand spraying rate and we use one-third the manpower."

Fast, uniform finishing

Switch housings are placed on conveyorized spindles which rotate as they pass through the spray booth. Binks pneumatically operated Model 21 automatic spray guns apply a uniform coating on all surfaces as each spindle passes.

Engineering help available

Working with your engineers and production people, Binks spray finishing engineers can help you cut costs...boost production...improve quality. Because Binks line of spray finishing equipment is so complete, they need not compromise in the selection of any part of a finishing system. The "right" equipment combination for your every production need, is always available.

For complete information

Contact your nearest Binks Branch Office or write direct to the address below.

Ask about our spray painting school
Open to all...NO TUITION...covers all phases.

Binks
EVERYTHING FOR SPRAY PAINTING

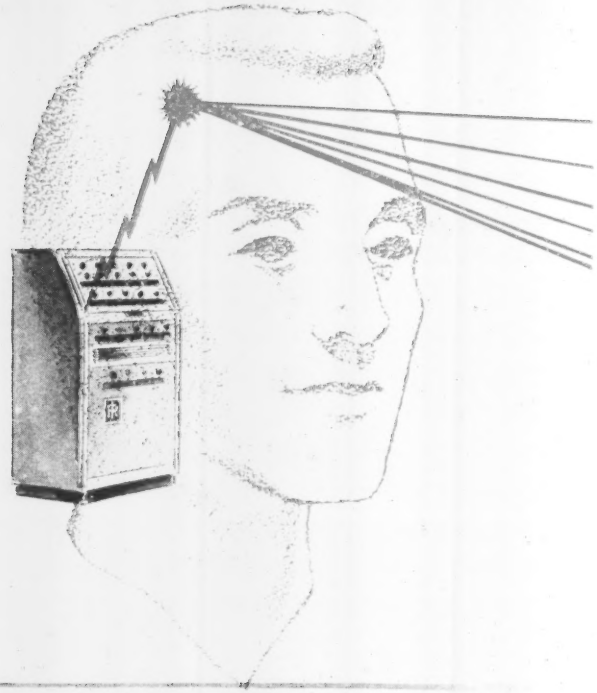
VISIT BOOTH 1501

National Metal Exposition & Congress
Cleveland, Ohio, October 27-31
See Modular Electrostatic Spraying and memory-controlled automatics

Binks Manufacturing Company
3122-30 Carroll Ave. West, Chicago 12, Ill.

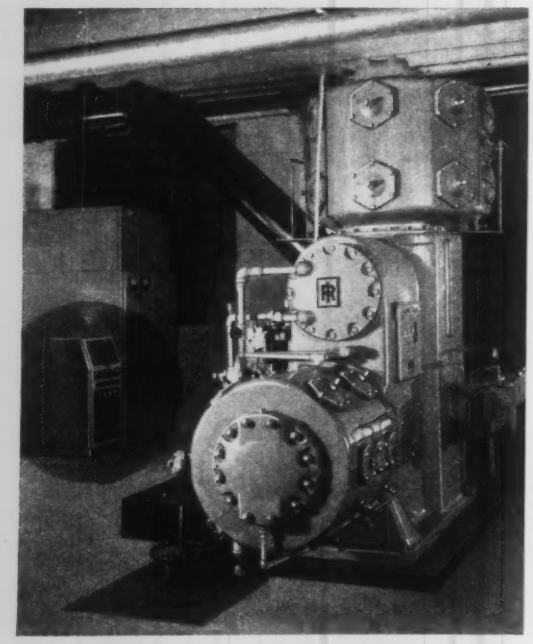
REPRESENTATIVES IN PRINCIPAL U.S. & CANADIAN CITIES • SEE YOUR CLASSIFIED DIRECTORY

MACHINES
THAT
MAKE
ENGINEERING
DREAMS
COME
TRUE

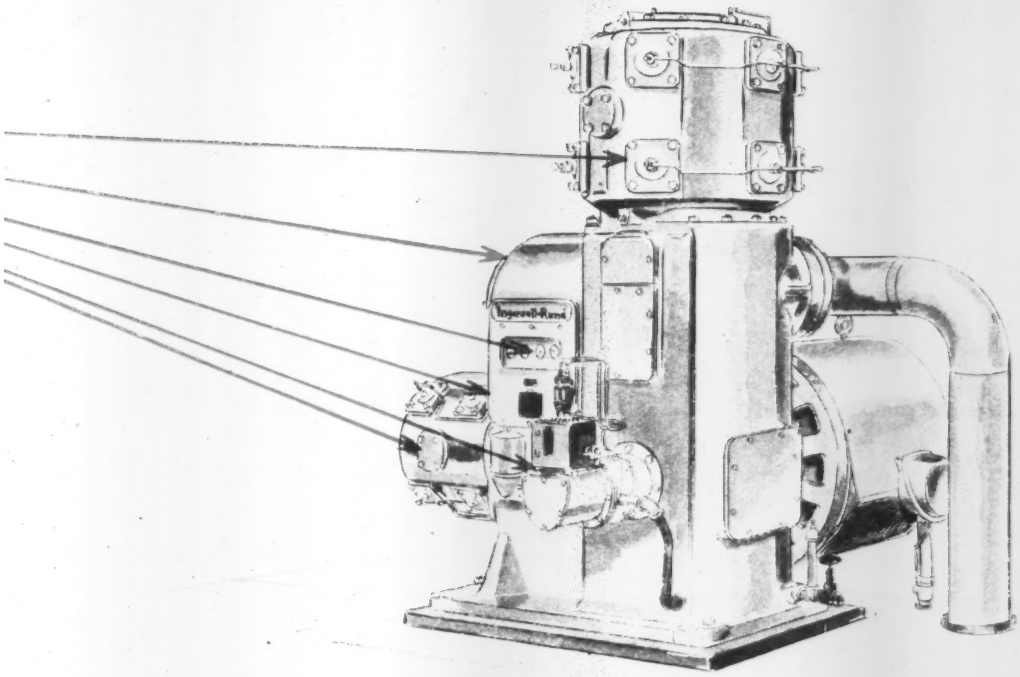


Making a

New 'Tendamatic control brings automatic supervision to the COMPRESSOR PLANT



(left) 'Tendamatic control of this two-stage heavy-duty air compressor, an Ingersoll-Rand type XLE packaged unit with built-in motor, assures maximum protection of capital investment, maximum manpower utilization, continuity of production and lower maintenance expense.



Compressor "Think for Itself"

Ingersoll-Rand's new *'Tendamatic* control is like a tireless attendant who keeps inspecting and checking the operation of the compressor every second.

All you need to do is push the "start" button on the control console. The *'Tendamatic* does everything from then on. You walk away knowing that the compressor is in good "hands". And here's why:

This completely automatic control system anticipates operating difficulties before they develop. It keeps an eye on air pressure and temperatures... lubricating-oil pressure and temperature... the cylinder lubricator... checks the float level in the condensate trap. It checks for leaking valves and mechanical failure of running parts.

Anytime there is a variation from normal compressor operation, the *'Tendamatic* identifies the nature of the malfunction and gives you audible and visible warnings in time to take corrective measures. If the warning is ignored or forgotten, *'Tendamatic* shuts down the compressor before any damage results. If oil pressure fails or if any vibration occurs, it stops the machine *at once* without advance warning.

These built-in safeguards entirely eliminate routine inspection and supervision... detect trouble before it can do any harm to the compressor... put all maintenance on a low-cost *preventive* basis.

For almost 90 years, Ingersoll-Rand has been making engineering dreams come true—with the constant improvement of I-R equipment to meet or anticipate the changing needs of America's growing industries. When you need equipment for compressing air or other gases, moving liquids, condensing steam, drilling rock, creating vacuums, or for industrial cooling, *think first of Ingersoll-Rand.*

'Tendamatic control is available only on Ingersoll-Rand air and gas compressors

Ingersoll-Rand

1-817 **11 Broadway, New York 4, N. Y.**

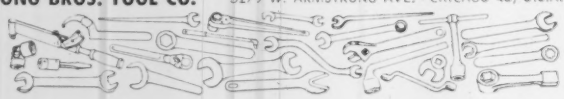
GAS & DIESEL ENGINES • PUMPS • AIR & ELECTRIC TOOLS • CONDENSERS • VACUUM EQUIPMENT • ROCK DRILLS

Fine tools that encourage Good Work

ARMSTRONG WRENCHES

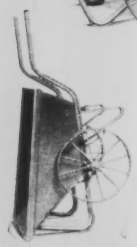
An ARMSTRONG Wrench feels right—is balanced. It goes over nuts or screw heads easily, grips firmly without sloppiness, won't round corners—because openings are carefully machined to correct sizes. It's safe, strong beyond need without clumsy bulk—because of superior design and selected steels, heat treated to proper degree of hardness and tensile strength. It's quality finished. ARMALOY (alloy steel) Wrenches in chrome plate with heads buffed; HI-TEN (carbon steel) Wrenches in baked-on gray enamel with heads ground bright . . . all plainly marked for size. All are uniformly excellent tools manufactured under strict quality control, by modern methods, with modern equipment in a modern tool plant . . . 1537 different industrial sizes and types—single wrenches, or sets in metal cases, boxes or rolls . . . each a quality tool. Armstrong Wrenches are "Fine tools that encourage good work."

ARMSTRONG BROS. TOOL CO. 5279 W. ARMSTRONG AVE. • CHICAGO 46, U.S.A.



GOES OVER BIG for wheeling and dumping heavy materials

Specify Sterling No. 119 HEAVY-DUTY CART
Pneumatic-tired wheels or steel wheels



Write for Bulletin or see nearest dealer.

Some areas open for dealerships.

Here's a cart that's "tailor-made" for wheeling coal, scrap, chips, turnings, borings and similar heavy materials. All-steel, completely welded and reinforced. Made extra strong and rugged for heavy-duty service. Dumps easily. Rests securely in any one of the three positions shown here. Available with steel wheels or pneumatic-tired wheels . . . plain or roller bearings.

STERLING NATIONAL INDUSTRIES, Inc.
Founded 1904 as Sterling Wheelbarrow Co.
MILWAUKEE 14, WIS., U.S.A.

Sterling WHEELBARROWS
Look for this Mark of STERLING Quality

A-7846-1½R2

Society for Nondestructive Testing

President, Carleton H. Hastings

TECHNICAL PROGRAM
IMPROVING PRODUCTION TECHNIQUES

Monday, Oct. 27—9 a.m.
Manger Hotel, Mather Room

EDUCATIONAL CLINIC

Chairman: D. W. Ballard, National Educational Committee, SNT.

Welcome—C. H. Hastings of Avco Mfg. Corp., president, SNT.

Welcome to Cleveland—Fred Meunier, chairman, Cleveland Section, SNT.

Orientation, Including Scope of Present Nondestructive Testing Field—D. W. Ballard, chairman, SNT Educational Committee.

Source of Defects Located by Nondestructive Testing—Carl E. Betz, Magnaflux Corp.

Radiography — W. D. Kiehle, Eastman Kodak Co.

Isotope Radiography—D. E. Elliott, Los Alamos Scientific Laboratory.

Nucleonic Gaging Methods—J. E. Reider, Industrial Nucleonics Corp.

Fluoroscopy—Walter Hampe, Westinghouse Electric Corp.

Penetrant Inspection—R. C. Eichin, Magnaflux Corp.

9:30 a.m.
Manger Hotel, Grand Ballroom

OPENING SESSION

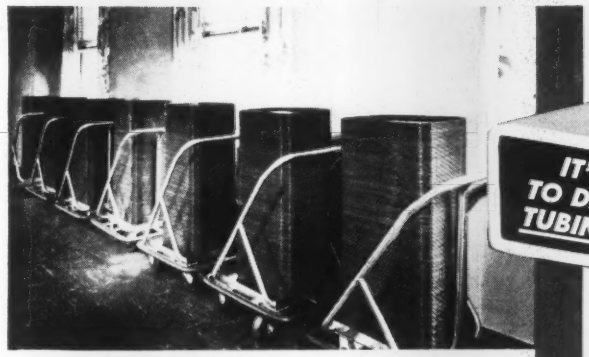
Chairman: R. E. Reynolds, Eastman Kodak Co.

Co-Chairman: M. J. Curtis, Naval Ordnance Test Station.

Welcome to Cleveland—F. A. Meunier, chairman, Cleveland Section, SNT.

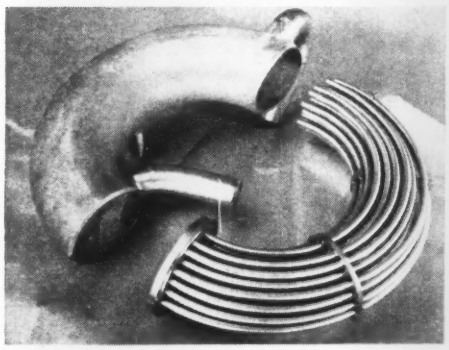
Opening Address—Carleton H. Hastings, president, SNT.

(*Please turn to Page 225*)

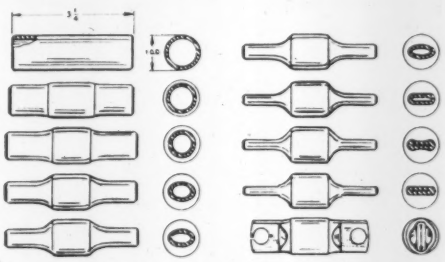


Tray carts of *welded* stainless steel tubing utilize the beauty and lasting finish of stainless—the structural advantages of tubing.

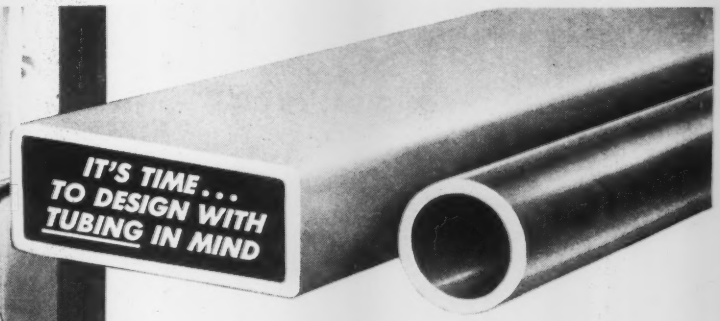
Welded steel tubing telescopes accurately in this farm equipment application—machining is not required.



For critical service in temperature and corrosion applications welded stainless steel tubing shows its merit in this cold head for nuclear equipment.



This die-pressing sequence illustrates the ductility of welded steel tubing for severe deformation requirements.



NO OTHER SECTION OFFERS THE

DESIGN ADVANTAGES

OF

WELDED TUBING

Carbon • Alloy • Stainless Steel

Only *welded* steel tubing can provide the inherent advantages of a hollow form's efficiency, strength and light weight *combined* with uniform wall thickness, concentricity, accuracy of dimension and ductility. Add to these your choice of surface finish, heat treatment, steel grade, size and shape.

You'll agree, only Welded Tubing can offer *all* of these design advantages. Your quality *welded* tube producer can always meet your exact specification.

FORMED STEEL TUBE INSTITUTE — FSTI

Specific information on welded tubing is available on request to:

FORMED STEEL TUBE INSTITUTE

850 HANNA BUILDING • CLEVELAND, OHIO

An Association of Quality Tube Producers

LC-581

AMERICAN ORIGINALS IN IRON AND STEEL

The forge in the chimney corner

As our nation continued to expand after the Revolutionary War, one of its most pressing needs was for greater production of simple, flat, iron nails. The nails of that time generally were crude fastenings, hammered by hand from strips of metal. The process was inefficient and time consuming. But, the need was so great that even children in the home were pressed into service as nail makers.

In 1789, a Member of Congress stated: "It has become common for our country people to erect small forges in chimney corners. Great quantities of nails are made . . . even by children." But a year later, in 1790, the situation was suddenly changed by a Jacob Perkins of Newburyport, Massachusetts. Perkins, a mechanical genius of his time, invented a nail-making machine capable of producing 200,000 nails per day, and thus brought an end to the task of household nail making.

* * * *

Many men, machines, methods and materials have contributed to the development of our iron and steel industry. We at The J. E. Baker Company are proud of the fact that, for many years, steel makers have relied on Baker's Magdolite and Jebcolite, the original dead-burned dolomites for more uniform ingots, greater furnace efficiency, and lower refractory costs. Magdolite and Jebcolite offer many advantages . . . in superior composition, preparation, strength, economy and quality.

ANOTHER AMERICAN ORIGINAL

JEBCO
PRODUCTS
SINCE 1889

BAKER'S MAGDOLITE
The original dead-burned dolomite

THE J. E. BAKER COMPANY

YORK, PENNSYLVANIA • PLANTS: BILLMEYER, YORK, PENNSYLVANIA • MILLERSVILLE, OHIO

SNT PROGRAM . . .

How Management Views Nondestructive Testing—H. Christen, Lockheed Aircraft Corp.

Electrode Potential Testing—P. D. Edwards, Los Alamos Scientific Laboratory.

New Low-Energy Photon Sources for Industrial Utilization—F. L. Green and W. D. Cheek, General Motors Corp.

Techniques for Improving Reliability of Electromagnetic Tests of Tubing—R. Hochschild, Metroll Inc.

2 p.m.

Manger Hotel, Grand Ballroom

HONEYCOMB AND SANDWICH MATERIAL

Chairman: W. R. Plant, Knolls Atomic Power Laboratory.

Co-Chairman: M. R. Jackson, Convair.

Qualitative Analysis of Brazed Sandwich—F. J. Filippi, Solar Aircraft Co.

Evaluation of Bond Quality in Honeycomb Panels Using Ultrasonic Surface Wave Techniques—E. T. Hughes and E. Burstein, Westinghouse Electric Corp.

Immersed Ultrasonic Inspection of Metal Plate—R. W. McClung, Oak Ridge National Laboratory.

Nondestructive Testing of Nonmetallic Materials—C. E. Betz, Magnaflux Corp.

Eddy Current Measurements of Metal Thickness and Cladding Thickness—R. A. Nance and J. W. Allen, Oak Ridge National Laboratory.

Nondestructive Testing of Bonded and Brazed Aircraft Structures—T. G. Bogle, Temco Aircraft Corp.

1:45 p.m.

Manger Hotel, Mather Room

EDUCATIONAL CLINIC

Chairman: Charles Tucker, Aluminum Co. of America.

Eddy Current Test Methods—R. Hochschild, Metrol Inc.

Magnetic Particle Inspection—W. E. Thomas, Magnaflux Corp.

Ultrasonic Inspection: Reflection and Contact Techniques—J. C. Smack, Curtiss-Wright Corp.

Ultrasonic Inspection: Immersed Techniques—W. C. Hitt, Douglas Aircraft Corp.

Ultrasonic Inspection: Resonant Techniques—K. P. Hayes, Branson Instruments Inc.

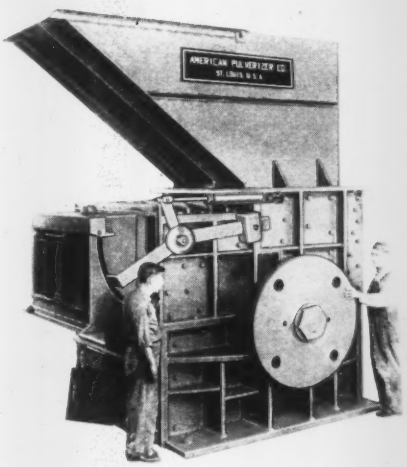
Educational Problems and Activities in Nondestructive Testing—R. C. McMaster, Ohio State University.

Monitors: J. H. Clemons, Ferro-Spec Laboratories; J. C. O'Neal, Sandia Corp.

(*Please turn to Page* 228)

it takes an AMERICAN

to CRUSH SCRAP LIKE THIS!



In an hour this capable American Rolling Ring Crusher reduces as much as 50 tons — a carload — of metal turnings . . . or 10 to 20 tons of aluminum castings and or stampings.

It's the American-originated rolling shredder rings of manganese steel that make it possible. Soundly engineered throughout, this 60-50 crusher is fully capable of handling large-scale primary reduction. Whatever your requirements there's an American that matches your need . . . from 10 tons per hour up to 50 tons per hour.

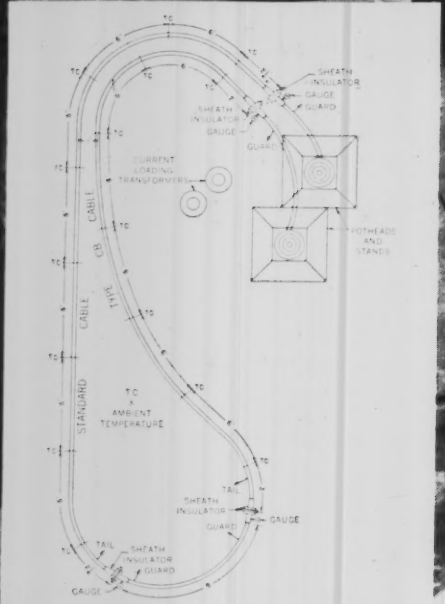
Get the complete story now. Write American; describe your capacity and other requirements.

American PULVERIZER COMPANY

ORIGINATORS AND MANUFACTURERS OF RING CRUSHERS AND PULVERIZERS

1539 MACKLIND AVE. ST. LOUIS 10, MO.

Cyclic aging test on paper-lead power cable reveals



RESEARCH LABORATORY SET-UP for cyclic aging test. Two single-conductor, 69kv shielded-type cables (one standard, one Anaconda Type CB) were spliced together to form a single cable. The cable was then subjected to cyclic aging for 404 daily load cycles. At end of test the two sections were studied—and revealed the results shown in chart at right.

Greater insulation stability...longer cable life with TYPE CB cable

Heat and electrical stress . . . heat and electrical stress—keep it up long enough and insulating oil in ordinary paper cable breaks down.

Anaconda Type CB* (Carbon Black) power cable is different. Special carbon-black tapes continually purify and stabilize the insulating oil over the life of the cable. These carbon-black tapes provide many advantages:

1. Oxidation products are removed.
2. Deterioration is reduced by continuous purification of the oil.
3. Conductor is shielded; strand discharges, and ionization discharges between insulation and sheath are eliminated; maximum stress is reduced more than 25 percent.
4. Destructive energy is reduced because the work function of carbon is much less than that of copper.
5. Surge currents are diminished.
6. Impulse strength is increased.
7. Dielectric strength and life are increased.

The over-all result is not only physical and electrical improvements, but also real economic gains for the user.

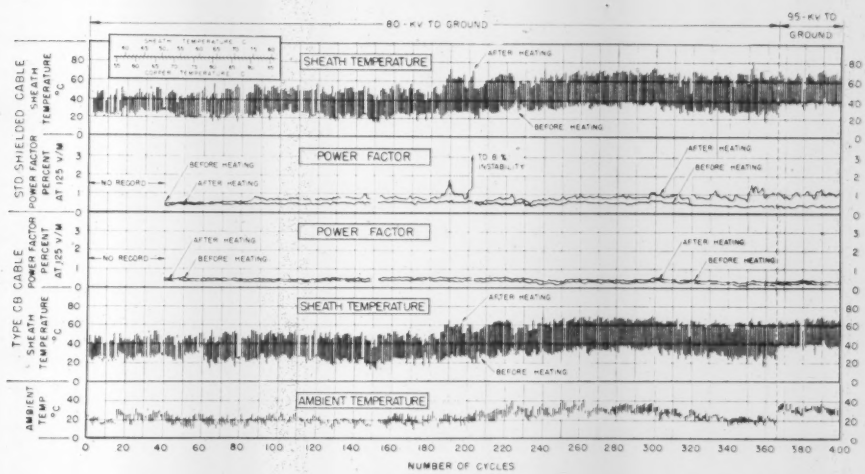
CYCLIC AGING TEST

For dramatic proof, no other test shows stability better than the cyclic aging tests.

The test shown here consisted of subjecting two single-conductor, 69kv shielded-type cables to cyclic aging for 404 daily load cycles. One cable was Type CB, the other a cable of standard construction. Both cables were still in operating condition at the end of the test. The standard cable, however, showed definite signs of aging. The Type CB cable showed no such signs.

WANT TO KNOW MORE? The Man from Anaconda will be glad to give you full information about Type CB cable. See him or write for Bulletin C-89. Anaconda Wire & Cable Co., 25 Broadway, New York 4, N. Y. 58331

*CB—Carbon Black (U. S. Patents 2,102,129; 2,405,863) Reg. U. S. Pat. Off.



CYCLIC AGING CHARACTERISTICS of 1 c, 650 Mcm, 69kv solid-type paper-insulated cable, standard construction compared to Type CB construction. Power factor readings during each cycle show low and constant values for Type CB cable—0.3 to 0.5 percent for both. The standard cable, with the same initial values, increased to over 1 percent at the end of the test. Power factor readings before and after heating during each cycle are also significant. At first, both cables show "after heating" values below those for "before heating." In the standard cable, the trend is reversed (69th cycle) and the "after heating" values are higher to the end. In the Type CB cable, the "after heating" values remain below throughout the test.

LIVE BETTER ELECTRICALLY

SEE THE MAN FROM **ANACONDA**®

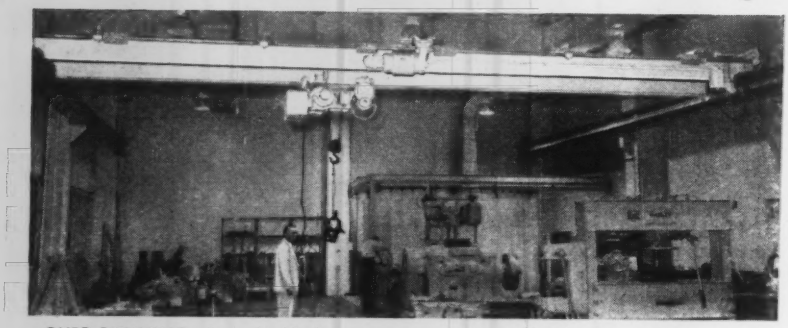
FOR **TYPE CB CABLE**

SHEPARD NILES

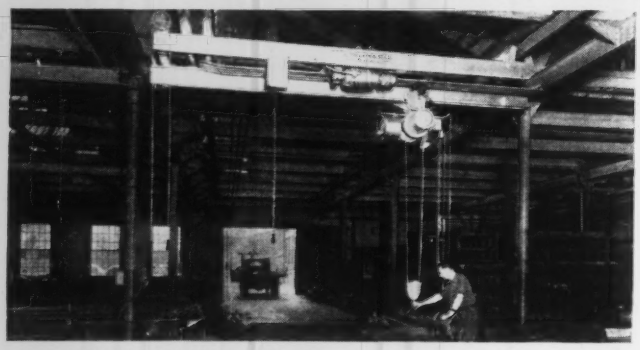
SINGLE BEAM CRANES

WHICH CRANE

. . . Over-running or Under-running?



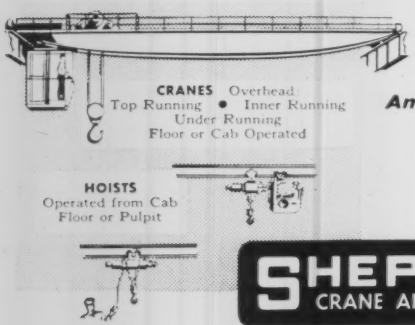
OVER-RUNNING where double beam cranes are not practical or for auxiliary service.



UNDER-RUNNING . . . for limited clearances . . . operating on runways hung from roof trusses!

Cut costly ground level handling. Move loads smoothly and safely overhead with Shepard Niles single beam cranes. Operate from floor or remote location. Push type or motor driven trolley type hoists, including close clearance units.

Send for Single Beam Crane bulletins today . . . or ask that a Shepard Niles representative call — there's NO OBLIGATION.



Building

America's Most Complete Line

of Cranes and Hoists

Since 1903

SHEPARD NILES
CRANE AND HOIST CORPORATION

2389 Schuyler Ave., Montour Falls, N. Y.

SNT PROGRAM . . .

Tuesday, Oct. 28—9 a.m.

Manger Hotel, Grand Ballroom

WELD EVALUATION

Chairman: J. F. Torbet, Los Alamos Scientific Laboratory.

Co-Chairman: H. Hovland, Industrial X-Ray Engineers.

Ultrasonic Weld Inspection—J. E. Bobbin, Sperry Products Inc.

Investigation of Radioisotopes for the Inspection of Ship Welds—D. Polansky, E. L. Criscuolo, and D. P. Case, Naval Ordnance Laboratory.

Radiographic Inspection of Welded Turbine Wheels for Jet Starters—A. R. Potenski, Bendix Aviation Corp.

Nondestructive Testing Assists the Small Manufacturer—A. G. Barkow, Marquette University, and S. J. Boehringer, Boehringer Engineering Products Inc.

Weld Evaluation by Magnetic Particle and Liquid Penetrant Inspection — Paul Maertz, A. O. Smith Corp.

Radiographic Inspection of Welded Highway Bridges—J. L. Beaton and Paul G. Jonas, California Division of Highways.

2 p.m.

Manger Hotel, Grand Ballroom

RADIOGRAPHIC

Chairman: D. Polansky, Naval Ordnance Laboratory.

Co-Chairman: J. F. Vokoun, E. I. du Pont de Nemours & Co.

New Techniques for Nonphotographic Observation of X-Ray Images—H. E. Haynes, Radio Corp. of America.

Fluoroscopic Image Intensifier Device—E. L. Criscuolo and C. Dyer, Naval Ordnance Laboratory.

An Electronic, High-Resolution X-Ray Imaging System—J. W. Allen and R. W. McClung, Oak Ridge National Laboratory.

Investigation of Ionographic Techniques—R. A. Youshaw and J. A. Holloway, Naval Ordnance Laboratory.

Using a Crystal to Continuously Display High-Energy X-Ray Images—J. S. Pruitt, National Bureau of Standards.

Experiments on the Comparison of the Radiographic Qualities of the 1 Mev. Resotron and the 1 Mev. Van de Graaff X-Ray Units—D. E. Elliott, Los Alamos Scientific Laboratory, and C. M. Knowles, Oak Ridge National Laboratory.

Wednesday, Oct. 29—9 a.m.

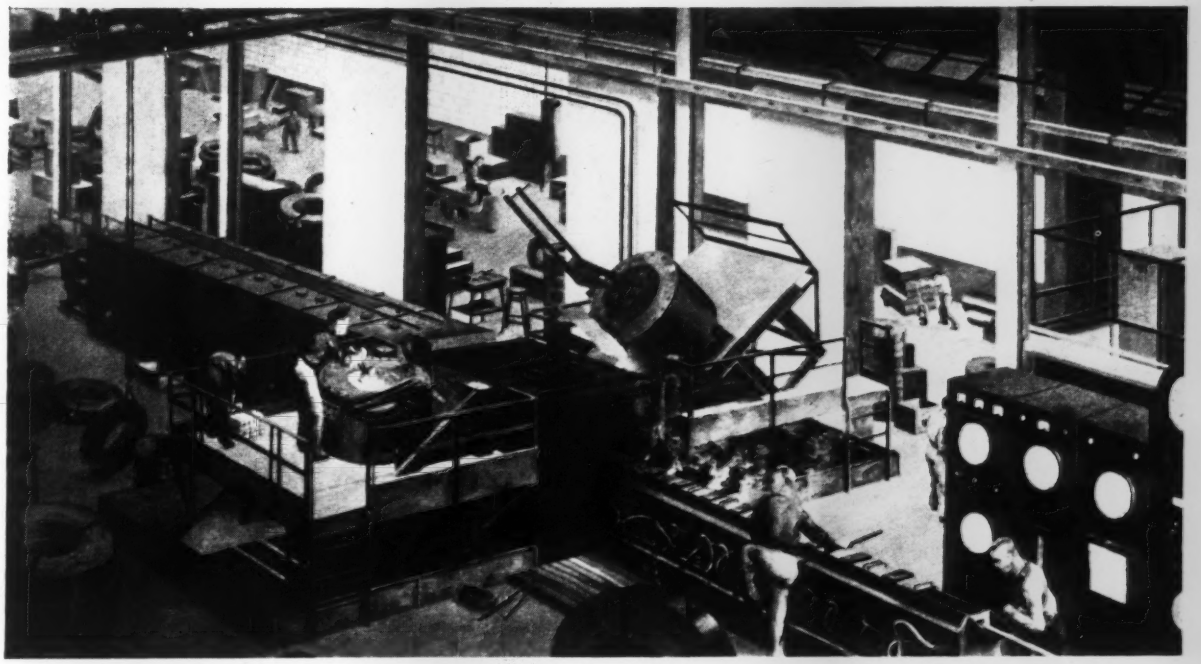
Manger Hotel, Grand Ballroom

MEASUREMENT AND EVALUATION

Chairman: R. W. Larson, Milwaukee.

Co-Chairman: S. Goldspiel, New York Naval Shipyards.

Industrial Application of Radioisotopes—



60 CYCLE INDUCTION MELTING OF HIGH LEADED BRONZES

15 years ago, THE CLEVELAND GRAPHITE BRONZE COMPANY, division of CLEVITE CORPORATION, pioneered 60 CYCLE INDUCTION MELTING of bronzes with up to 35% lead. Special furnaces developed by AJAX for this difficult job are an important element in their unique continuous production line for steel-backed bronze bearing strip. 60 CYCLE INDUCTION MELTING furnaces resulted in substantial improvements and cost savings over gas-fired units used earlier for that purpose. Today, CLEVITE operates six continuous lines in this country and abroad with AJAX 60 CYCLE INDUCTION MELTING furnaces, producing enough strip to make 130 million bearings and bushings per year.

The heavy duty 60 cycle inductor developed by AJAX and pioneered by CLEVITE will attain a lining life of one year with bronzes of substantial lead content. Electromagnetic stirring assures uniform alloy and close temperature control. Compared to externally fired equipment, metal loss savings run into many thousands of dollars per year. Recently, several large producers of leaded bronze castings converted their foundries entirely to 60 CYCLE INDUCTION MELTING.

While this is one of the most difficult metals to handle, the advantages of 60 CYCLE INDUCTION MELTING stand out today wherever copper alloys are melted. As specialists in 60 CYCLE INDUCTION MELTING, we have developed furnace types to best fill each application.

We invite you to discuss your melting problems with us at the NATIONAL METAL SHOW, CLEVELAND, Oct. 27-31, BOOTH 1608

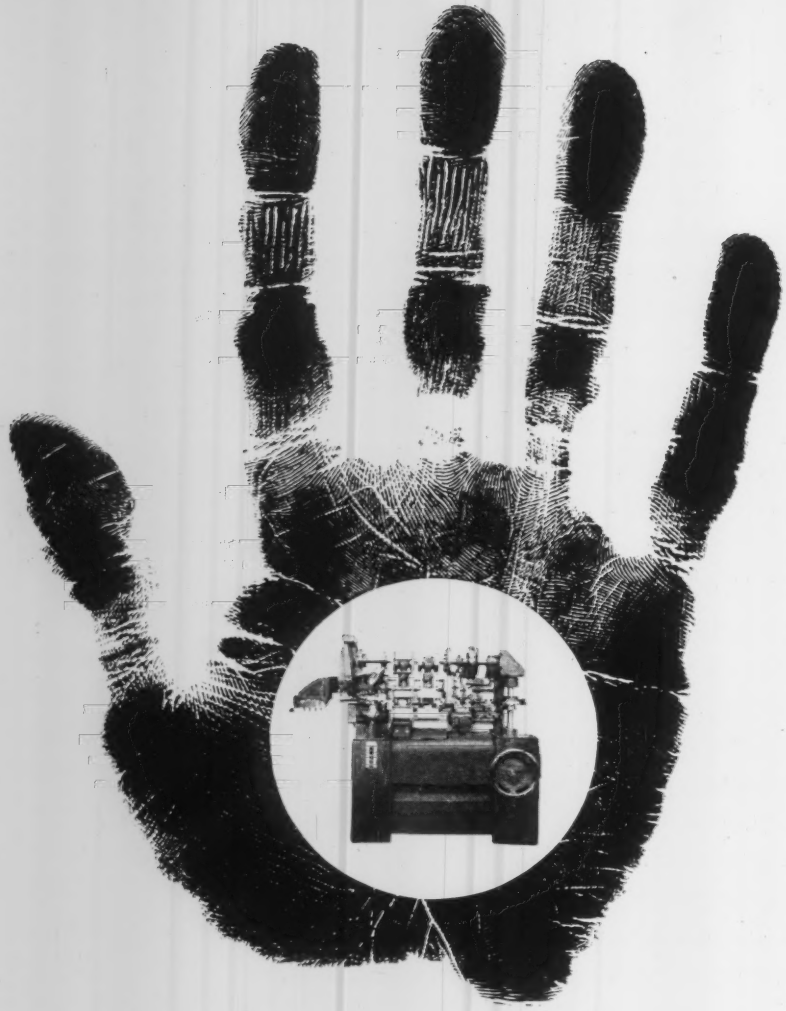
AJAX USA

ENGINEERING CORPORATION

TRENTON 7, NEW JERSEY

60 CYCLE INDUCTION MELTING

Associated Companies: Ajax Electrothermic Corporation Ajax Electric Company



SHOW STOPPER

It's the new Torrington Verti-Slide, the first major innovation in the field of 4-SLIDE equipment in 50 years!

This machine was designed to meet a growing need for greater productivity and profitability in the cost-critical area of wire and strip forming.

Seldom before has a new machine created such immediate and widespread interest. We urge you to get the full story. Write or call today.

THE TORRINGTON MANUFACTURING COMPANY

TORRINGTON, CONNECTICUT · VAN NUYS, CALIFORNIA · OAKVILLE, ONTARIO

SNT PROGRAM . . .

S. Regas, Radiation Counter Laboratory Inc.

Some Recent Advancements in Gaging and Nondestructive Testing with Radioisotopes—O. M. Bizzell, U. S. Atomic Energy Commission.

Use of Radiography for Inaccessible Internal Measurements—H. Howard, Dalmo Victor Co.

Early Detection of Fatigue in Aluminum Alloys by Ultrasonics—K. Sittel, Franklin Institute.

Fatigue Properties of Ultrasonically Tested Aluminum Alloy Plates and Forgings—J. L. Waisman, Tatnall Measuring Systems; L. L. Soffa, Northrop Aircraft; P. W. Kloeris and C. S. Yen, Douglas Aircraft.

Cermet Body Nondestructive Test Data Evaluated by Spin Tests of Blades and Bend Tests of Bars—A. G. Holms and A. J. Repko, NACA.

2 p.m.

Manger Hotel, Grand Ballroom

SNT HONOR SESSION

Chairman: C. H. Hastings, president, SNT.

LESTER HONOR LECTURE

By Brig. Gen. John A. Barclay, U. S. Army Ordnance Missile Command.

ANNUAL BUSINESS MEETING

Your Society—Where Is It Going?—W. E. Thomas, chairman of Past-Presidents Committee, SNT.

7:30 p.m.

Manger Hotel, Grand Ballroom

SNT BANQUET

Flight Safety and Reliability—Maj. Gen. J. D. Caldara, Norton Air Force Base. (Address to be delivered by Col. George W. Kinney.)

Presentation of the first Noah Kahn Award, sponsored by the Metropolitan Section, SNT, to Ben Hoitsma.

Presentation of the De Forest Award, sponsored by SNT and the Magnaflux Corp., to W. A. Black of Republic Steel Corp.

Presentation of the Coolidge Award, sponsored by SNT and General Electric Co., X-Ray Dept., to Benjamin Kazan, Hughes Research Laboratory.

Presentation of the Du Pont Award, sponsored by SNT and E. I. du Pont de Nemours & Co., to Al F. Cota, A. O. Smith Corp.

Thursday, Oct. 30—9 a.m.

Manger Hotel, Grand Ballroom

TUBING AND PIPING

Chairmen: W. E. Havercroft, Department of Mines & Technical Surveys,

SUPERIOR STAINLESS

Automotive Trim

opens the door to sales

The magnetic *appeal* of solid stainless steel is stronger than ever for today's careful car buyers. It starts with inviting brilliance . . . keeps pulling with the promise of carefree enjoyment . . . clinches matters with the time-proved ability of stainless to keep new-looking to trade-in day.

● *Build sales with Superior Stainless!*

Superior Steel

DIVISION OF

COPPERWELD STEEL COMPANY

CARNEGIE, PENNSYLVANIA

For Export: Copperweld Steel International Company, New York

A MOMENT WITH MANAGEMENT...

INCREASED PRODUCTIVITY

not merely INCREASED PRODUCTION

will widen your profit margins

Testing offers a new production tool to increase productivity at very low cost. Early detection of all parts headed for the scrap heap enables you to take corrective action *before* additional machining costs are invested in them.

THE PRODUCTION MANAGER will be able to maintain established quality levels (or meet new higher standards) — eliminate intermittent excessive scrapping of finished parts and often even reduce normal parts scrappage.

THE SALES MANAGER will benefit from consistent reliable quality — increased customer satisfaction — reduced or stabilized costs — increased competitive ability.

HIGHER PROFIT PERCENTAGE will result because the returns will be increased from your present man-hours and plant investment.

Can you afford to overlook these benefits? Write today for a free copy of "Lower Manufacturing Costs", an informative booklet. Or, ask our Field Engineer to discuss where and how low-cost Magnaflux Test Systems have helped others increase plant productivity.

The Hallmark of *Quality* in nondestructive test systems

MAGNAFLUX CORPORATION • 7312 W. Lawrence Avenue, Chicago 31, Illinois

Ottawa; B. J. Cunningham, Westinghouse Electric Corp.

Ultrasonic Testing of Small-Diameter, Tubular, Stainless Steel Fuel Elements —G. E. Fulmer, W. R. Grace & Co.

Magnetic Particle Inspection of Steel Tubing and Pipe—R. G. Strother, Magnaflux Corp.

Radiographic Evaluation of Stainless, Inconel, and Titanium Tubing under 4-in. Diameter—J. A. Kramer, NTH Products Inc.

Eddy-Current Inspection of Welded Aluminum Tubing—Dr. E. Kunkle, Aluminum Co. of America.

Some Uses for a Precision Magnetic Field Meter—R. A. Betz, Westinghouse Electric Corp.

Radiographic Inspection of Thin-Wall Small-Diameter Tubing—G. M. Tolson and A. Taboada, Oak Ridge National Laboratory.

2 p.m.

Manger Hotel, Grand Ballroom

STEEL AND HEAVY METALS

Chairman: M. D. Phillips, ACF Industries.

Co-Chairman: James L. Coburn, Convair.

Effect of Deformation and Magnetic Field on Ultrasonic Attenuation in 1013 Steel —R. Truell, Brown University.

Ultrasonic Testing Procedures—J. D. Morgan, Allegheny Ludlum Steel Corp.

Atomic Energy Commission Isotope Licensing Requirements—J. W. Hitch, Atomic Energy Commission.

Correlation of Ultrasonic Indications and Physical Properties of High-Strength Steels—C. F. Raatz Jr., Boeing Airplane Co.

Use of the Beam Deflector to Ultrasonically Test Bronze Castings—N. J. Socoloski, Curtiss-Wright Corp.

Quality and Economic Improvements Resulting from Nondestructive Testing—H. McFaul and Cleo Webb, Douglas Aircraft Corp.

Friday, Oct. 31—9 a.m.

Manger Hotel, Grand Ballroom

STANDARDS FOR NONDESTRUCTIVE TESTING

Chairman: R. G. Strother, Magnaflux Corp.

Co-Chairman: E. L. Criscuolo, Naval Ordnance Laboratory.

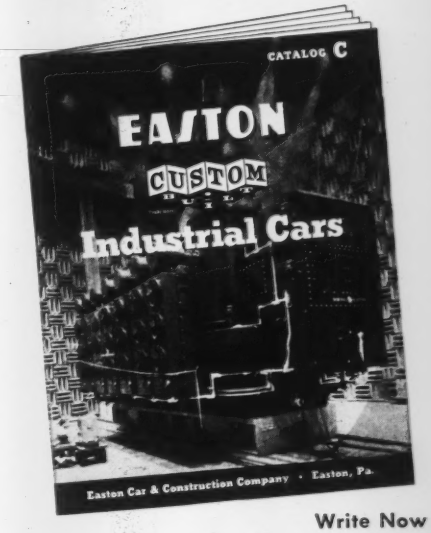
Percent Ring Method for Eddy-Current Acceptance Standards—Hamilton Migel, Magnaflux Corp.

Standards for Production Electromagnetic Testing of Steel Tubing—F. A. Meunier, Republic Steel Corp.

Radiographic Standards for Aluminum

(*Please turn to Page* 236)

IDEAS for heavy duty materials handling



CUSTOM BUILT TRADEMARK

EASTON CATALOG C describes 39 different types of heavy duty EASTON industrial cars and trailers, with capacities from 2 to 500 tons, including motorized and automated units, for handling all kinds of loads.

IDEAS inspired by EASTON CATALOG C may save important time and money in your heavy handling operations.

A-4061

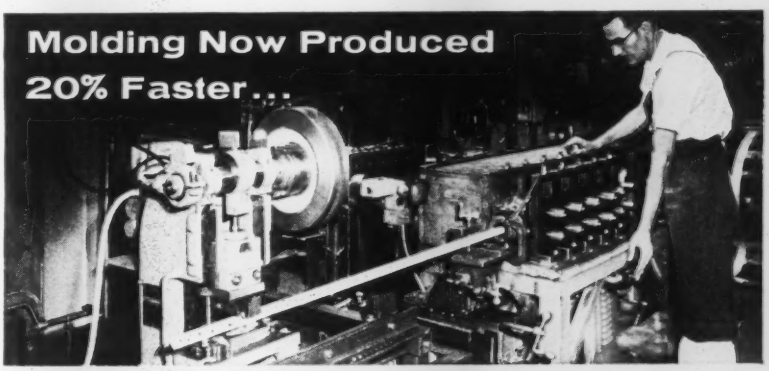
Write Now for Free Copy of Catalog C

Domestic Offices and Representatives

Easton, Pa. Chicago Philadelphia
Boston Milwaukee Pittsburgh
Buffalo New York St. Paul

EASTON

EASTON CAR & CONSTRUCTION COMPANY · EASTON, PA.



with KENCO 5-TON PUNCH PRESSES

Steel molding is now made 20% faster with one operator from coil in one automatic operation, utilizing two Kenco 5-ton presses at Universal Molding Company, Lynwood, California. The first Kenco is fed continuously from a roll feed and operates at 500 strokes per minute to punch a standard hole pattern. Rollers then form the material into an angular molding which is cut off automatically (burr free) to lengths of 8' ± 1/16" in a Kenco 5-Ton Punch Press. Formerly the strips were sawed which left objectionable burrs on the ends. In 1½ years of operation of 1 and 2 shifts per day the Kencos had a *minimum of maintenance*.

Kenco Presses are precision built for maximum production—They weigh up to 30% more, permit up to 100% overloading, have solid crank shafts free from weakening slots, a driving dog that strikes a hardened and ground plate, and many other exclusive features that keep them on the job.

You too can increase production with Kenco Presses—and at the same time increase profit. Can we give you additional information?

Job Facts:

Company: Universal Molding Company, Lynwood, California • Machines: Two Kenco 5-Ton Punch Presses • Job: Making steel molding from coil • Accuracy: Cut-off 8' ± 1/16", Burr Free • Former Method: Sawing which Burred Ends • Shifts: 1 & 2 per day, for 1½ years • Maintenance: Very little • Savings: 20% Faster

Write for literature covering 2, 5, 8 and 15 ton Standard and Deep-Throated Kenco Presses.

KENCO MANUFACTURING CO.

5211 Telegraph Rd., Los Angeles 22, Calif.

When you buy from U. S. Steel

STEEL+PLUS IN ACTION: RESEARCH

This picture of the inside of an open hearth furnace was taken by a high-speed motion picture camera that takes up to 3000 frames per second. When the pictures are projected at normal viewing speed, one second of action lasts almost four minutes! This permits U. S. Steel researchers to record and study in detail the action taking place inside the furnace. New and intimate knowledge like this helps to improve the quality and production of USS steels.

American Bridge • American Steel & Wire and Cyclone Fence • Columbia-Geneva Steel • Consolidated Western Steel • National Tube • Oil Well Supply Tennessee Coal & Iron • United States Steel Homes • United States Steel Products • United States Steel Supply and Gerrard Steel Strapping Universal Atlas Cement • United States Steel Export Company

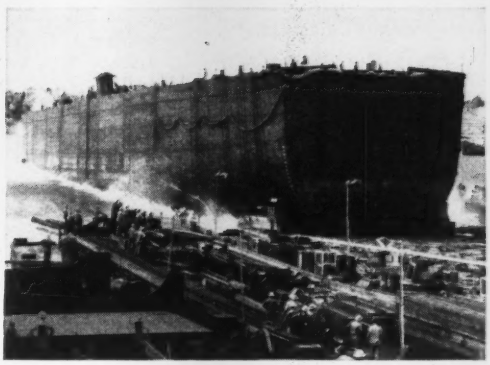
you get STEEL + PLUS

STEEL + PLUS IN ACTION: MARKETING ASSISTANCE

Through U. S. Steel's extensive national television and magazine advertising, millions of the buying public are being presold on the advantages of consumer products made of *steel*, and on the STEELMARK as the symbol which assures them of this. To enable manufacturers and retailers of consumer steel products to get full benefit from the continuing STEELMARK program, STEELMARK tags, labels and merchandising helps are being made available to them without charge.

STEEL + PLUS IN ACTION: TECHNICAL ASSISTANCE

A turbine manufacturer made discs from a special alloy steel that had to be forged, cross-rolled, heat treated, and torch-cut to size . . . *before* machining. Our metallurgists suggested the use of USS "T-1" Steel supplied in circular plates. "T-1" Steel had better mechanical properties and it eliminated the need for forging and cross-rolling. The manufacturer adopted "T-1" Steel and saved 60% in material costs.



STEEL + PLUS IN ACTION: FACILITIES

The T-2 Tanker of World War II fame is not big enough to be practical today. So they "jumboize" it—cut the ship apart and insert a new and bigger mid-body section. Thus such tankers, otherwise obsolete, again become economical carriers, saving their owners millions of dollars through the greater capacity and years of service. American Bridge Division of U. S. Steel has the facilities, experience, and personnel to handle a wide range of all-welded steel Marine construction.

USS and "T-1" are registered trademarks

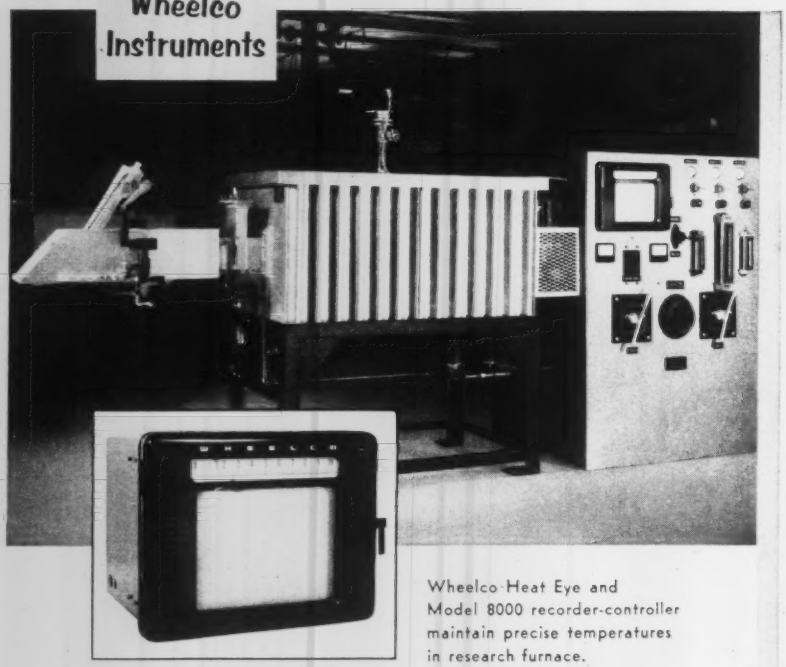
USS **United States Steel**

THE MARK OF QUALITY

BARBER COLMAN

Wheelco Instruments

Outstanding control accuracy provided for furnace temperatures topping 3600° F



Wheelco Heat Eye and Model 8000 recorder-controller maintain precise temperatures in research furnace.

This special molybdenum rod resistance furnace, capable of reaching temperatures above 3600° F in a hydrogen atmosphere, was built by CM Inc., Bloomfield, N. J., for a large industrial research center. Furnace is controlled by using the Wheelco Heat Eye radiation detector and a Model 8000 recorder-controller.

Wheelco instruments are specified on this furnace, and on similar units built by CM Inc. for processing ceramics and other materials in controlled atmospheres, because they provide the outstanding accuracy that is mandatory in ultra-high-temperature processing. Where permanent process records are not required, Wheelco 400 Series indicating controllers can be used in place of the 8000 Series units.

If you aren't already using Wheelco instrumentation to control high-temperature processing, then your nearby Wheelco field engineer is the man you should meet. His analysis of how your instrumentation efficiency can be improved is available without obligation.

BARBER-COLMAN COMPANY

Dept. J, 1596 Rock Street, Rockford, Illinois, U.S.A.

BARBER-COLMAN of CANADA, Ltd., Dept. J, Toronto

SNT PROGRAM . . .

and Magnesium Castings—B. R. Swarts, Convair.

Some Recent Applications of Eddy-Current Equipment for Inspection in the Field—V. Wiegand and W. Bodenstein, General Electric Co.

Ultrasonic Attenuation Characteristics of Various Steel Alloys—C. J. Adams, Rocketdyne.

Standards for Electromagnetic Testing of Tubing—H. E. Babb, Metrol Inc.

2 p.m.

Manger Hotel, Grand Ballroom

ULTRASONICS

Chairman: R. A. Pulk, Detroit Arsenal.

Co-Chairman: F. W. Armstrong, Babcock & Wilcox Co.

Implications of Ultrasonic Attenuation to Nondestructive Testing—J. K. White, R. W. McClung, and J. W. Allen, Oak Ridge National Laboratory.

Effect of Fabrication on Inclusion-Type Defects and Their Ultrasonic Response—G. J. Binczewski, Kaiser Aluminum & Chemical Corp.

An Ultrasonic Testing Monitor—F. C. Panian, Aluminum Co. of America.

Use of Special Ultrasonic Portable Devices for Inspection of Plates and Hand Forgings—C. W. Cline and S. G. von Stocker, Aluminum Co. of America.

Nondestructive Testing of Solid Propellent Rocket Motors—M. E. Liebman, Aerojet-General Corp.

Immersed Ultrasonic Testing with Contoured and Focussed Transducers—R. C. McMaster, Automation Instruments Inc.

AIME

Institute of Metals Division AIME

ALL MEETINGS CARTER HOTEL

Monday, Oct. 27—9 a.m.

Lorenzo Carter Room

SYMPOSIUM ON POINT IMPERFECTIONS

Irradiation Damage and Point Imperfections—J. W. Corbett, General Electric Co.

(*Please turn to Page 238*)

NOW! ALLMETAL LOCAL SERVICE FOR FASTER DELIVERY

There's no stock like the largest stock, and Allmetal has the largest stock of stainless steel fasteners in the world	Allmetal specializes in all types of stainless steel fasteners, screws, nuts, bolts, washers, rivets, pins, 'AN' fasteners, etc.	Batteries of cold headers and automatic screw machines ready to turn out special fasteners to your specifications.	And if you need stainless steel fasteners, fast!—Allmetal can deliver from stock within 24 hours

ALLMETAL SCREW PRODUCTS COMPANY, INC.

821 Stewart Avenue, Garden City, L. I., New York Ploneer 1-1200

MIDWEST DIVISION

6424 West Belmont Avenue, Chicago 34, Illinois AVenue 2-3232, 3, 4

WEST COAST DIVISION

5822 West Washington Boulevard, Culver City, California WEbster 3-9595

manufacturers of stainless steel fasteners

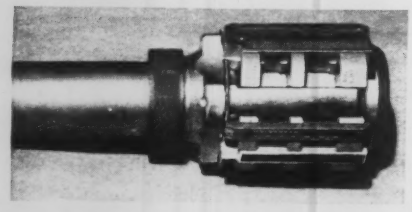
WHY MICROHONING* TOOLS ASSURE

ECONOMY—PRECISION—PRODUCTION

COST FACTORS (labor, maintenance, scrapped parts, productivity, etc.) DETERMINE MACHINE TOOL EFFICIENCY.

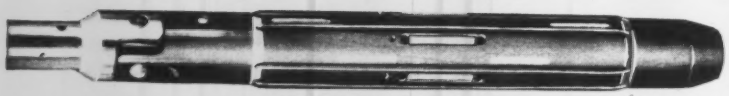
To Minimize These Cost Factors, Micromatic has developed Microhoning tools that offer a new concept in metalworking. This concept (known as the Microhoning process) assures controlled abrading, efficient stock removal, accurate generation of geometry and size, and produces uniform, functional surface finishes.

Because Microhoning removes inaccuracies of preceding operations, it is usually the final stock removal operation. Therefore, Microhoning tools are designed and applied to produce high precision, assure a minimum of scrap and protect the user's investment in previous processing operations.



New! Tru-Float tool has a universal joint within the abrading unit. This design provides maximum accuracy and float, uniform abrading and surface finish, less wear of abrasives, retention of original bore location, and minimum stock removal to correct inaccuracies.

Micromold assemblies have plastic or soft metal shells that minimize tool wear and protect the edges of abrasive sticks from the harsh dressing action of extremely rough bores. This abrasive stick design eliminates many parts previously required to hold abrasives and expand the tool.



Tool designed for Microhoning tandem bores has plastic guides between banks of abrasives to stabilize the tool as it p.sses over bore interruptions.

Because use of the proper tool is so important, Micromatic designs Microhoning tools to suit the individual work piece, and integrates tool design with machine and fixturing to provide the ultimate in operating efficiency.

Registered U.S. Pat. Off

MICROMATIC HONE CORP.

8100 SCHOOLCRAFT AVENUE • DETROIT 38, MICHIGAN

AIME PROGRAM . . .

Internal Friction and Point Imperfections—C. A. Wert, University of Illinois.

Thermal Treatment and Point Imperfections—A. S. Nowick, Columbia University.

Oak Room

GENERAL METALLURGY

Freezing of Liquid Metal in a Mold—G. Horvay and J. G. Henzel, General Electric Co.

Gas Desorption of Nickel Powders—J. F. Watson, Convair, and M. J. Sinnott, University of Michigan.

Hydrogen in Cold Worked Iron-Carbon Alloys and the Mechanism of Hydrogen Embrittlement—M. L. Hill and E. W. Johnson, Westinghouse Electric Corp.

Aging of Hydrogen Charged Steel—H. C. Rogers, General Electric Co.

Fatigue in Single Crystals of Copper—M. L. Ebner and W. A. Backofen, Massachusetts Institute of Technology.

Hardening Characteristics of Polycrystalline Copper under Fatigue Loading—M. L. Ebner and W. A. Backofen, Massachusetts Institute of Technology.

Reduction of Nickel Oxide—R. E. Cech, General Electric Co.

Nucleation of Whiskers Formed by Reduction of Nickel Bromide—R. E. Cech, General Electric Co.

Embassy Room

OXIDATION AND MECHANICAL PROPERTIES

Oxide Particle Dispersions in Internally Oxidized Copper-Aluminum Alloys—D. L. Wood, General Electric Co.

Mechanical Properties of Internally Oxidized Copper-Aluminum Alloys—D. L. Wood, General Electric Co.

Recrystallization of Internally Oxidized Copper-Aluminum Alloys—D. L. Wood, General Electric Co.

Strengthening of Copper Alloys by Internal Oxidation—M. S. Ali and V. A. Phillips.

Effect of Oxygen on the Tensile Properties of Titanium—C. Feng, C. Elbaum, and W. C. Winegard, University of Toronto.

Role of Oxide Plasticity in the Oxidation Mechanism of Pure Copper—J. A. Sartell, R. J. Stokes, S. H. Bendel, T. L. Johnston, and C. H. Li, Minneapolis-Honeywell Regulator Co.

Initial Oxidation Rate of Nickel and Effect of the Curie Temperature—H. Uhlig, J. Pickett, and J. MacNairn, Massachusetts Institute of Technology.

Lorenzo Carter Room

SYMPOSIUM ON GOVERNMENT-SPONSORED RESEARCH ON SEMICONDUCTOR METALLURGY

Industrial Impact of Transistors—J. A. Morton, Bell Telephone Laboratories.

Review of Armed Services Activities—W. R. Cherry, U. S. Army; R. Cornelissen, Air Force Cambridge Research Center; and Paul Egli, Naval Research Laboratory.

2 p.m.

Ballroom

SYMPOSIUM ON EFFECT OF ORDERING ON MECHANICAL PROPERTIES

Deformation Characteristics of Superlattices—P. A. Flinn, Westinghouse Electric Corp.

Deformation and Annealing of the Alloy Cu3Au—J. B. Cohen, B. Roessler, and M. B. Bever, Massachusetts Institute of Technology.

Effect of Ordering on the Plastic Behavior of Iron-Aluminum Alloy—F. X. Kayser, Ford Motor Co.

Effect of Ordering on the Mechanical Properties of Beta Brass—N. Brown, University of Pennsylvania, and M. Herman, Franklin Institute.

Anneal Hardening in Aluminum Bronze—R. W. Cahn, S. Chinowsky, and R. G. Davies, University of Birmingham, England.

Ordering and Creep Properties of Iron—R. W. Cahn, S. Chinowsky, and R. G. Davies, University of Birmingham, England.

Lorenzo Carter Room

ANNEALING OF METALS

Effect of Atmosphere on Secondary Recrystallization in High-Purity Silicon-Iron—J. L. Walter and C. G. Dunn, General Electric Co.

Initial Growth Behavior of a Secondary Recrystallization Cube-Oriented Nucleus—C. G. Dunn and J. L. Walter, General Electric Co.

Secondary Recrystallization in Silicon-Iron—J. E. May and D. Turnbull, General Electric Co.

Tertiary Recrystallization in Silicon-Iron—J. L. Walter and C. G. Dunn, General Electric Co.

On the Determination of Preferred Orientations—C. G. Dunn, General Electric Co.

Temperature Dependence of Preferred Orientation in Rolled Tungsten—J. W. Pugh, General Electric Co.

X-Ray Diffraction Study of the Perfection of Aluminum and Copper Crystals Grown in the Solid State—M. N. Parthasarath and P. A. Beck, University of Illinois.

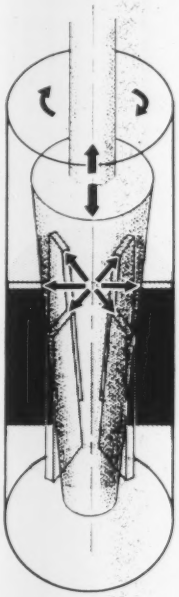
Annealing of Point Defects in Cold Worked Tungsten and the Influence of Impurities on the Kinetics—L. A. Neimark, Argonne National Labora-

(*Please turn to Page 242*)

HOW MICROHONING* TOOLS PROVIDE

ECONOMY—PRECISION—PRODUCTION

When a precision stock removal process minimizes cost factors (labor, maintenance, scrapped parts, etc.) then volume production at lower cost per piece is possible. Here's how the distinctive design and performance of Microhoning tools provide all three—economy, precision and production.



EFFICIENT OPERATION

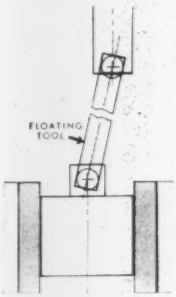
Micromatic expands, rotates and reciprocates the abrading tool in the bore. Through this controlled combination of pressure and movements, abrasives are self-dressing for effective and continuous cutting action. Long abrasive sticks are evenly spaced around the tool to keep it stable. They effectively bridge surface irregularities and generate a geometrically true cylinder.

REDUCES OPERATOR COSTS

Micromatic "Adjusting Heads" give operator complete and positive control of tool expansion. Or, automatic controls can be used to perform all tool adjustment and gaging. They assure accurate duplication in every part produced.

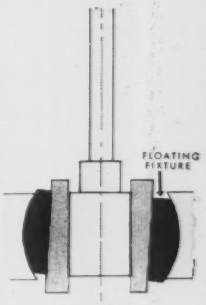
MINIMUM MAINTENANCE

Micromatic tools are designed for durability, especially at all stress points and joints. Plastic or soft metal holders prolong abrasive life, greatly reduce tool wear.



MAINTAINS ORIGINAL BORE LOCATION

Micromatic either floats the tool or the work holding fixture so tool and work piece can automatically align themselves. This assures cutting-unit rotation coincides with neutral axis of bore.



WRITE FOR LITERATURE

Micromatic produces tools best suited to the production of individual work pieces. And properly integrates the tool with machine and fixturing for peak productivity at lowest cost per piece produced.

*Registered U.S. Pat. Off.

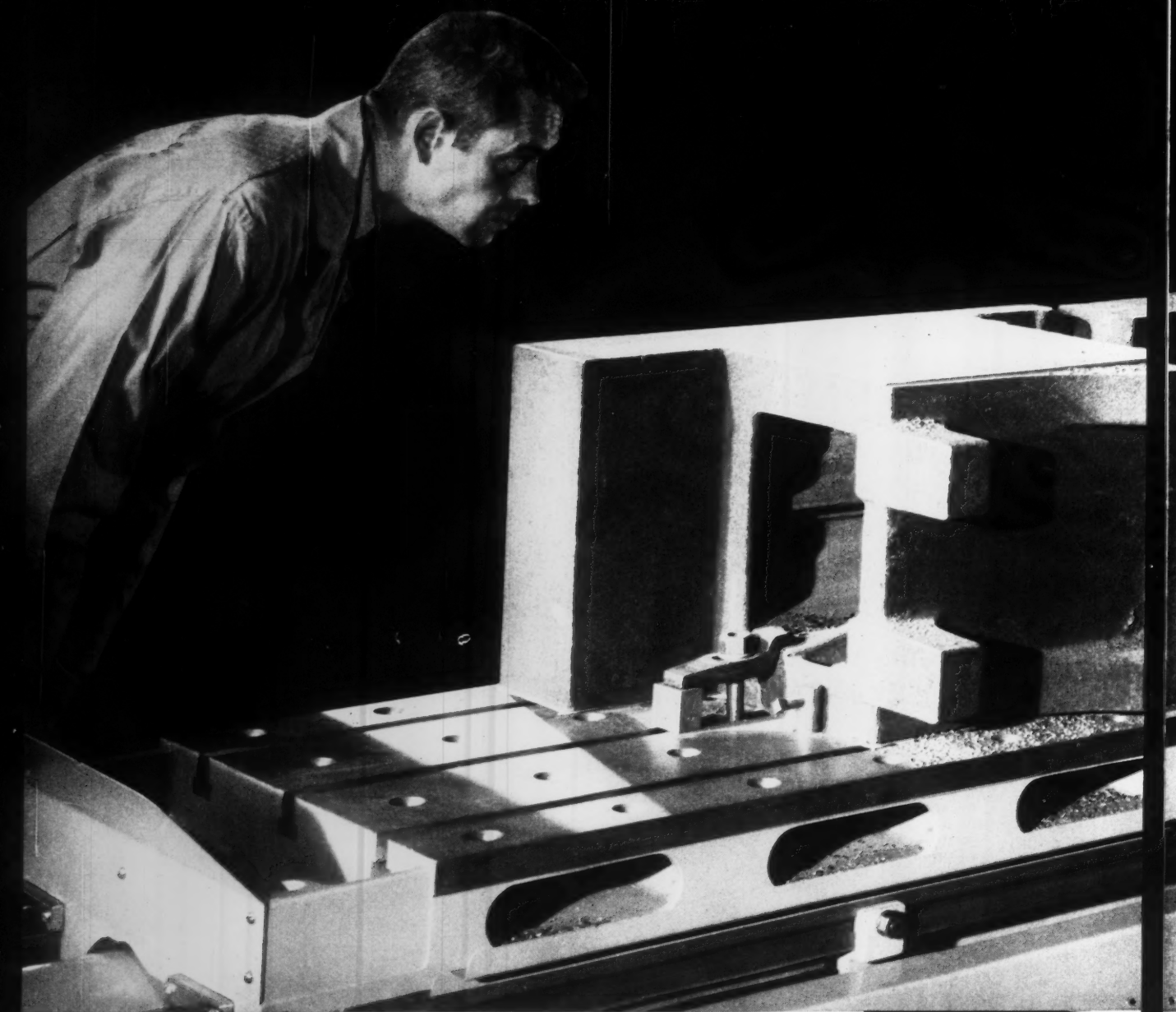
MICROMATIC HONE CORP.

8100 SCHOOLCRAFT AVENUE · DETROIT 38, MICHIGAN

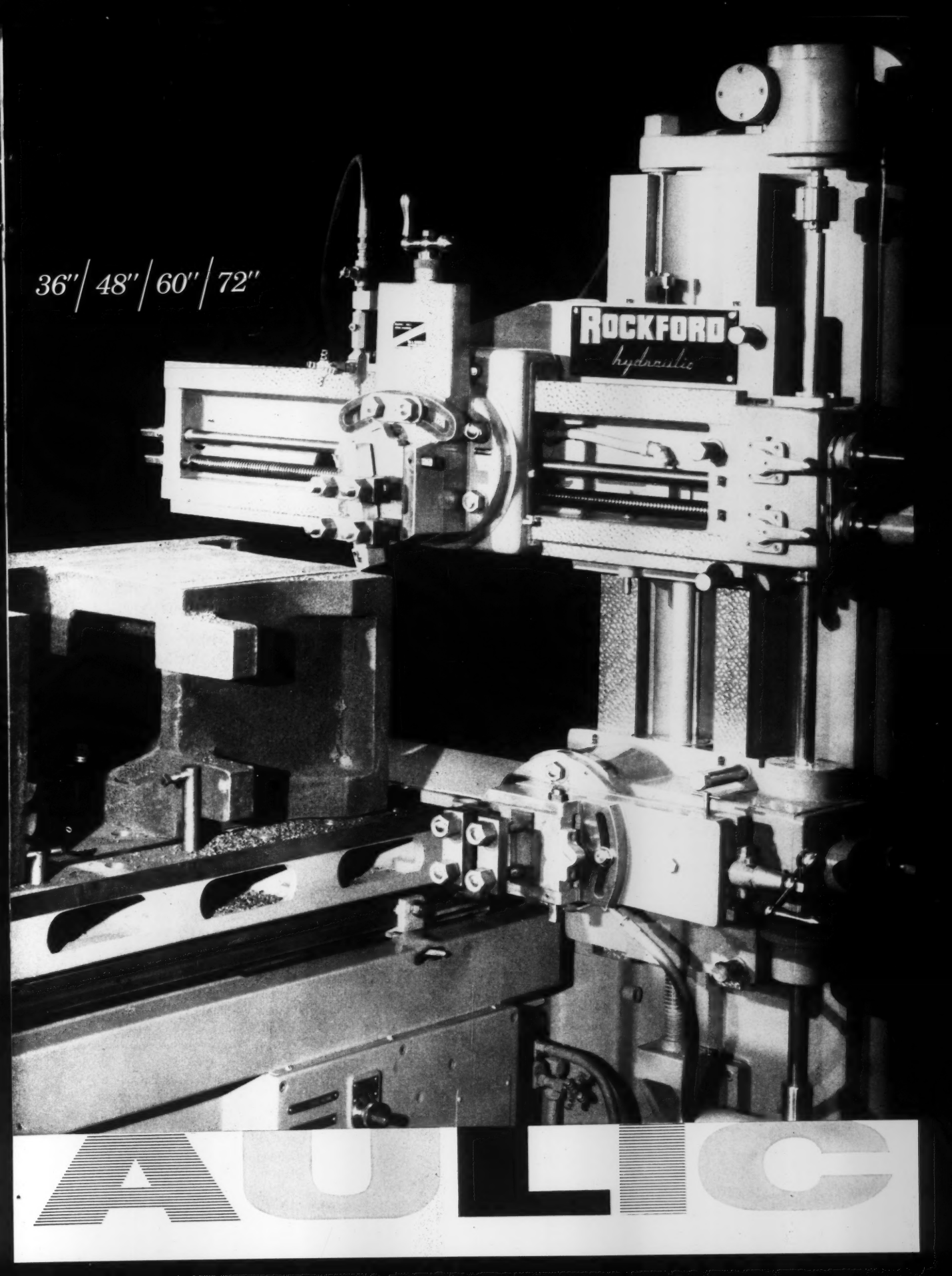
ROCKFORD MACHINE TOOL CO. 2500 KISHWAUKEE STREET ROCKFORD, ILLINOIS

DON'T SPEND BIG MONEY TO DO BIG JOBS!

Put them on a Rockford Hy-Draulic Openside Shaper



HY-DR


36" | 48" | 60" | 72"
ROCKFORD
hydraulic
AULIC

T-J spacemaker cylinder

Quality Engineered

to give quality results

with Extras . . .
at No Extra Cost!

You get more—much more—when you specify and use any of T-J's complete line of Spacemaker cylinders. The Spacemaker is engineered to give you better, more accurate, and longer service—offers, exclusively, many extras . . . that are STANDARD, AT NO EXTRA COST!

Designed to eliminate tie-rods, providing greater strength . . . saves space . . . reduces manhours and costs in all push-pull-lift operations. IMMEDIATE SHIPMENT in a wide range of styles and capacities, with 64,000 combinations. Write for Bulletin SM 155-3 with complete engineering details. The Tomkins-Johnson Co., Jackson, Mich.

METAL PISTON ROD SCRAPER . . . Standard at No Extra Cost!

NEW "SUPER" CUSHION FOR AIR . . . Standard at No Extra Cost!

CHROME PLATED CYLINDER BORES AND PISTON RODS . . . Standard at No Extra Cost!

ONE PIECE PISTON . . . Standard at No Extra Cost!

NEW "SELF-ALIGNING" MASTER CUSHION FOR HYDRAULIC USE . . . Standard at No Extra Cost!

NO TIE-RODS TO STRETCH . . . Standard at No Extra Cost!

STREAMLINED DESIGN . . . Oil Pressure to 750 P.S.I.—air to 200 P.S.I. Standard at No Extra Cost!

FORGED SOLID STEEL HEADS . . . Standard at No Extra Cost!

T-J **TOMKINS-JOHNSON**
RIVITORS AIR AND HYDRAULIC CYLINDERS CUTTERS CLINCHORS

AIME PROGRAM . . .

tory, and R. A. Swalin, University of Minnesota.

Temperature Dependence of Grain Boundary Migration in High-Purity Lead Containing Small Additions of Tin—K. T. Aust and J. W. Rutter, General Electric Co.

Oak Room

EQUILIBRIUM AND MICROSTRUCTURES

Zirconium and Hafnium Phases Isostructural with Ti_2Ni—M. V. Nevitt and L. H. Schwartz, Argonne National Laboratory.

Ternary System Zirconium-Silicon-Boron—Erwin Parthe and J. T. Norton, Massachusetts Institute of Technology.

Use of Controlled Solidification in Equilibrium Diagram Studies—W. A. Tiller, Westinghouse Electric Corp.

Solid-Liquid Phase Equilibrium in the Bi_2Te_3-Bi_2Se_3 Pseudo-Binary System—J. P. McHugh and W. A. Tiller, Westinghouse Electric Corp.

CsCl-Type Equiatomic Phases in Binary Alloys of Transition Elements—A. E. Dwight, Argonne National Laboratory.

Effect of Chromium on the Stability of Cementite—George Sandoz and B. F. Brown, U. S. Naval Research Laboratory.

Embassy Room

DEFORMATION—I

Anomalous Effect of Hydrogen on the Mechanical Properties of Ti-8 Mn and Ti-4 Al-4 Mn Alloys—A. H. Fleitman, Crane Co.

Effect of Complexing on Mechanical Properties of Ti-6 Al-3 Mo Alloy—F. A. Crossley, Armour Research Foundation, and W. F. Carew, Joliet Metallurgical Laboratories Inc.

A Decision Technique for Evaluating the Effect of Melting and Casting Environments on Stress-Rupture Properties—J. T. Brown, Westinghouse Electric Corp.

Short-Time Creep of Some Graphites at 3000-5300° F—H. E. Martens, L. D. Jaffee, and D. D. Button, California Institute of Technology.

Ductility of Polycrystalline Ceramics—C. E. May, H. H. Grimes, and R. A. Lad, NACA.

Effect of Surface Condition on the Initiation of Plastic Flow in Magnesium Oxide—R. J. Stokes, T. L. Johnston, and C. H. Li, Minneapolis-Honeywell Regulator Co.

Three-Dimensional Ductility and Crack Propagation of Preferentially Oriented

Three-time ABC winner, famous bowler BILL LILLARD slams in strike after strike sending ball and pins flying against piece of TI-CO set up in pit. Close up examination by Bill shows plenty of punishment but no flaking. TI-CO's zinc coating rolled with the punch!

BOWLING CHAMP FAILS TO FLAKE INLAND TI-CO®!

Switch to **TI-CO** Non-Flaking Galvanized saves manufacturers up to 15% in Production Costs.

A well-known garage door manufacturer dispensed with plating operations—reduced costs 10%. A leading furnace manufacturer saved $20 per thousand parts produced by eliminating cleaning and painting. A company making roller gravity conveyors cut out similar operations. These are just a few of many case histories of manufacturers who realized important savings and improved their product when they started using TI-CO Galvanized Sheets.

Whenever a product requires the strength of steel, plus corrosion resistance, Inland TI-CO is the most satisfactory . . . the most practical . . . the most economical material to use. That's because TI-CO is produced with a zinc coating that will not flake even under the toughest conditions. The coating stretches with the base metal during fabrication. Deep drawing, brake or roll forming, crimping, stamping, lock-seaming even severe spin-drawing . . . TI-CO takes them all in stride with no flaking or peeling. With TI-CO there's no need for costly dipping or touching up. And the uniform, bright spangled finish adds to the over-all attractiveness of the product.

If you're manufacturing or designing a metal product that requires corrosion resistance, consider TI-CO Galvanized Sheets. Manufactured in coils or cut lengths up to 60″ widths, gauges 8 to 30 inclusive. Consult your local steel distributor or Inland sales representative. Write today for a free informative booklet on TI-CO.

INLAND TI-CO®

INLAND STEEL COMPANY

30 W. Monroe Street • Chicago 3, Illinois

Sales Offices: Chicago • Milwaukee • St. Paul • Davenport St. Louis • Kansas City • Indianapolis • Detroit • New York

Why it makes sense to upgrade your metal-cutting band saws now!

This is the best time to replace your old sawing machines because:

1. Faster Cutting Rates

Fifteen years of progress in the last five—that's what DoALL band machining now offers you! For example, DoALL's Demon® HSS Blades on new DoALL machines cut 10 times faster—and last 30 times longer than any carbon blade.

The reason: DoALL's new Contour-matics® are built far more rugged to attain greater accuracy than ever before. They employ coolant and hydraulic work feed.

The result: enormous savings in production time and labor in your shop—an entirely new concept in metalworking undreamed of with the early Model ML, which uses only carbon blades.

2. Old Machines Now Worth More

There's more value in your old DoALL now than there ever will be. In numerous cases the current market price of the obsolete Model ML equals or exceeds its original cost. Rather than give up the "old faithful," many users have found other uses for it in their own plants—for the scope and application of band saw machining has expanded greatly every year.

3. Easier Terms

Long-term purchase contracts are available for all DoALL machine tools.

A lease program, originated by DoALL, is available for those who want to take advantage of cost-saving DoALL equipment without capital expenditure.

4. Lower Costs

"Tooling for competition" requires a frank appraisal of your sawing costs. **Let us demonstrate the new performance of DoALL band machining.**

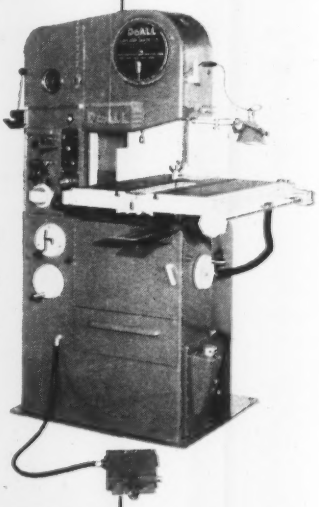
5. Productive Maintenance

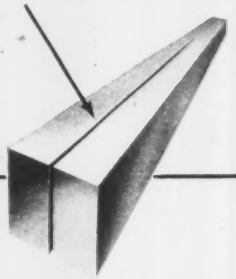
Productive maintenance is your assurance of continuous profitable performance on all DoALL machines. It's a free service to DoALL users. Ask your local DoALL representative.

COMPARE . . .

1958 MODEL 16-3 GIVES YOU . . .

592% faster sawing on 1015 mild steel— 10.1 sq. in. per min.!

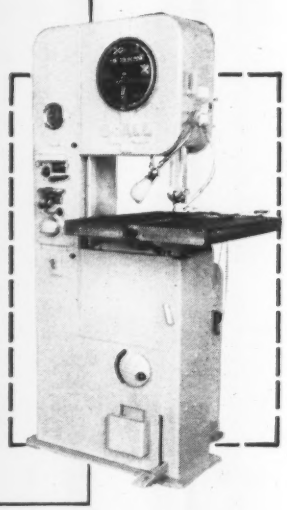


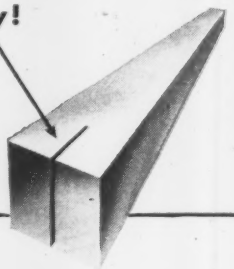


Heavy-duty Model 16-3 with coolant and hydraulic work feed, designed for Demon HSS Blade.

OBSOLETE MODEL ML GIVES YOU . . .

a cutting rate of only 1.7 sq. in. per min. —terrific in its day but unprofitably slow today!





Model ML, designed for carbon blade only.

B-54

The DoALL Company, Des Plaines, Illinois

THIS IS A TYPICAL DoALL STORE

Call Your DoALL Service-Store

MACHINE TOOLS ..... CUTTING TOOLS ..... MEASURING INSTRUMENTS ..... SHOP SUPPLIES IN STOCK

AIME PROGRAM . . .

Beryllium Sheets — F. M. Yans and A. R. Kaufmann, Nuclear Metals Inc.

Creep of a Dispersion-Hardened Aluminum Alloy—G. S. Ansell and J. Weertman, U. S. Naval Research Laboratory.

Tuesday, Oct. 28—9 a.m.

Lorenzo Carter Room

SYMPOSIUM ON EFFECTS OF SMALL DIMENSIONS

Properties of Whiskers—N. Cabrerâ, University of Virginia.

Mechanical Properties of Thin Films — J. W. Beams, University of Virginia.

Magnetic Properties of Whiskers, Thin Films, and Small Particles—C. P. Bean, General Electric Co.

Embassy Room

SYMPOSIUM ON PHYSICAL CHEMISTRY OF HALIDE SYSTEMS

Factors Affecting the Rate of Deposition of Metals in Thermal Dissociation Processes—G. H. Kesler, Battelle Memorial Institute.

Use of Heat and Mass Transfer Model Studies in the Evaluation of the Rates of Deposition of Metals in Complex Systems—G. H. Kesler and J. H. Oxley, Battelle Memorial Institute, and C. E. Dryden, Ohio State University.

Iodide Columbium—R. F. Rolsten, E. I. du Pont de Nemours & Co.

Oak Room

SYMPOSIUM ON STEELMAKING IN THE SOVIET UNION—I

Raw Materials—J. B. Austin, U. S. Steel Corp.

Blast Furnaces and Coking—J. H. Strassburger, National Steel Corp.

Openhearths—M. F. Yarotsky, U. S. Steel Corp.

Electric Furnaces—K. C. McCutcheon, Consultant.

Ballroom

TITANIUM METAL SYMPOSIUM—I

Price, Quality, and New Process Prospects for Titanium Sponge, Ingot and Billet: Panel—Graham Brown, Mallory-Sharon Metals Corp.; D. H. Baker Jr., Bureau of Mines; G. A. Moudry, Harvey Aluminum Co.; W. E. Lusby Jr., E. I. du Pont de Nemours & Co. Summary Address—H. H. Kellogg, Columbia University.

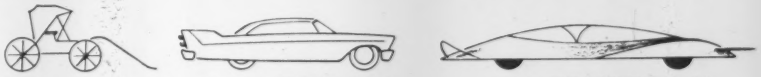
Price Trends and Market Analysis of Titanium Products—R. L. Vroome, Electro Metallurgical Co.

Current and New Uses of Titanium in Missiles, Aircraft, and Aircraft Powerplants: Panel—W. H. Sharp, Pratt & Whitney Aircraft; A. Hurlich, Convair Astronautics; and L. J. Hull, Ryan Aeronautical Co.

(*Please turn to Page* 248)

Kinnear Rolling Doors

Basic advantages make them first choice in any era...



Yesterday TODAY *TOMORROW...*

The door with the curtain of interlocking steel slats was *originated* by Kinnear. Its advantages are basic — as important to door efficiency as the invention of the wheel to improved land travel.

It is today's finest type of door, *made the finest of its type by Kinnear.* For example:

Opening straight upward, Kinnear Rolling Doors coil out of the way above the opening, into the compact hood mounted on the wall either inside or outside the opening (or often within the wall, where desired).

Kinnear Rolling Doors also give you full use of all space around doorways at all times. *No extra space of any kind is needed for their opening and closing action.* And *Kinnear* design makes sure the opened door always rests *above* the lintel — never steals clearance space overhead.

The rugged interlocking steel-slat curtain *(originated by Kinnear)* also gives you added protection against fire, theft, vandalism, storms, and accidental damage.

For extra resistance to weather and corrosion, Kinnear Rolling Doors are heavily galvanized, with 1.25 ounces of pure zinc per square foot of metal (ASTM standards).

Kinnear Rolling Doors are built any size, for easy installation in either old or new buildings of any construction. Manual-lift, chain, or crank operation — or motorized push-button control. Also available in non-ferrous metals. *Write for full details.*

The KINNEAR Mfg. Co.

Offices and Agents in All Principal Cities

FACTORIES:

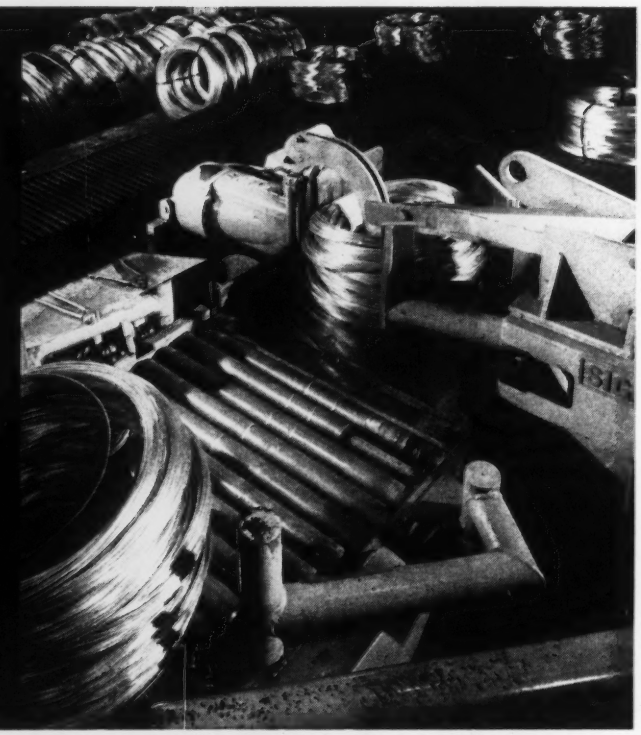
1780-1800 Fields Ave., Columbus 16, Ohio

1742 Yosemite Ave., San Francisco 24, Calif.

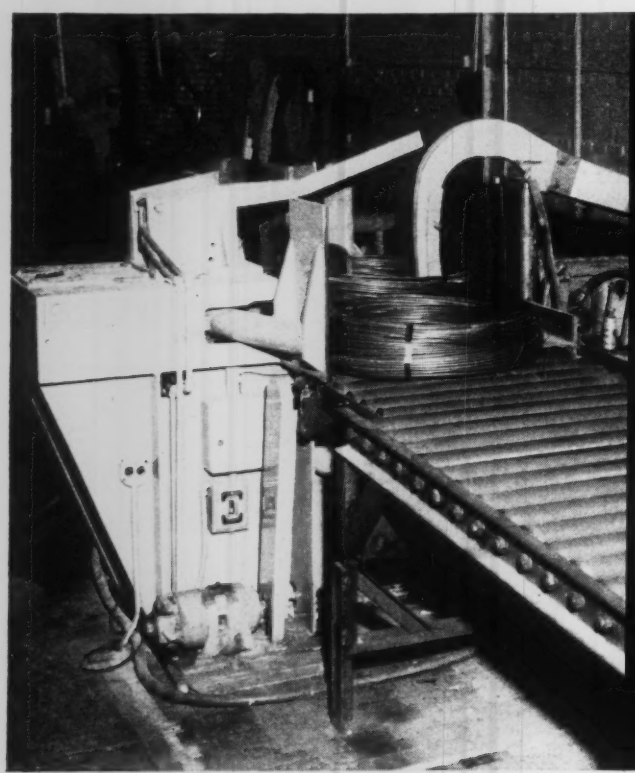
KINNEAR ROLLING DOORS

Saving Ways in Doorways

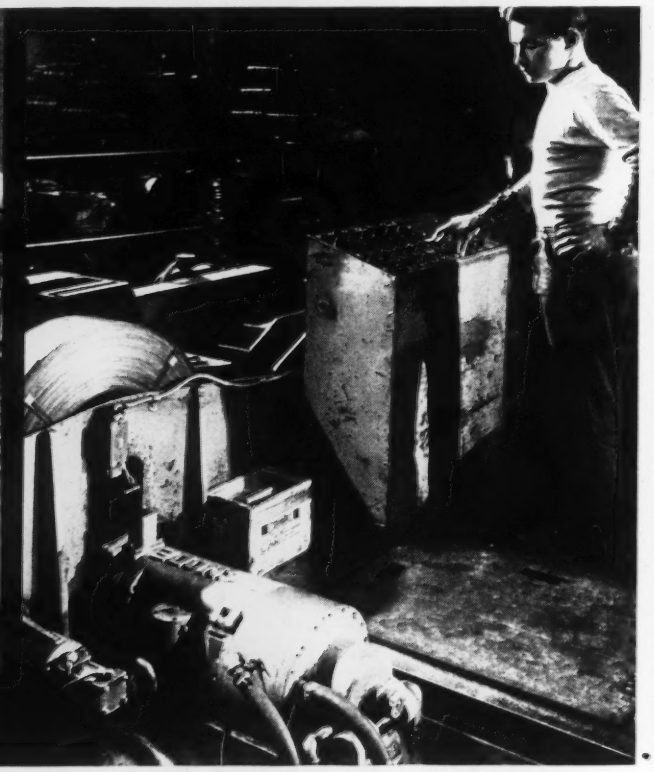
This completely automatic nail carton strapping machine has been in operation since 1955. Semi-automatic machines of this type have been in steel mill operation since 1946.



Three men tie 800 rod or wire coils in one shift, 3 straps per coil, with this MH11 automatic machine. Signode wire coil strapping machines have been in use since 1949.



This machine was installed in 1954. Coil after coil is tied tight, quickly. Coils are more compact, are easier to handle, take less space in storage and in transit.



One man straps an average of 600 strip coils in 8 hours with this machine, which also tightens coils and squares up edges. Similar Signode machines have been in use since 1948.

This MH10 push-button strapping machine has been strapping *hot* coils—1200° F.—dependably since 1953, at a rate of 120 coils per hour, 3 straps per coil.

Operator selects number of straps and strap position for coils of various sizes. Here, coils are also automatically stacked on pallets and up-ended for lift truck handling.

These Signode machines are proved

...by 12 years of dependable operation
...by rugged service in 73 steel mills

You don't need to gamble when you're considering automatic strapping equipment. The dependability and high production per man-hour of Signode machines has been proved by as much as 12 years of operation in the hardest kind of steel mill service... often in around-the-clock production where down-time would have been extremely expensive. If you count on savings, depend on Signode.

First in steel strapping

SIGNODE STEEL STRAPPING CO.

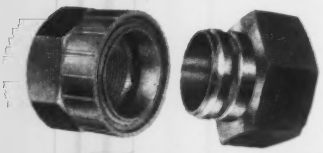
2645 N. Western Avenue, Chicago 47, Illinois

Offices Coast to Coast. Foreign Subsidiaries and Distributors World-Wide
In Canada: Canadian Steel Strapping Co., Ltd., Montreal • Toronto

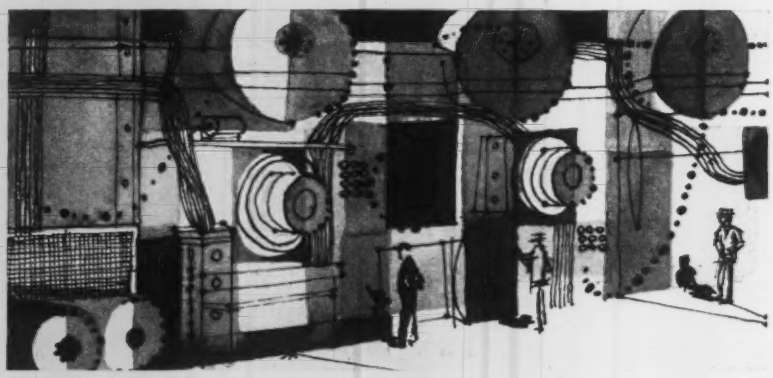
Roylyn

ALL PURPOSE

OPEN COUPLINGS



INDUSTRIAL COUPLINGS



COMPARE . . . TEST . . .
THEN USE THE BEST

- Quick Connecting
- Full Flow
- Ease of Operation
- Positive Lock
- Increased Efficiency
- Minimum Maintenance
- Maximum Efficiency
- Rugged Construction

. . . all adding up to "down-time" cut in half and production schedules met with half the effort.

SELF-SEALING COUPLINGS

CUT "DOWN-TIME" IN HALF

SAVE...SAVE...SAVE

With every roll change . . . the nation's steel, tin, aluminum, paper and allied mills are saving up to 60 man-minutes with every roll change . . . a saving of thousands of dollars made possible with Roylyn Industrial Couplings!

Wherever hose connections are made, they can be connected or disconnected faster and easier with Roylyn "Quick" Couplings . . . FOLLOW THE LEADERS OF INDUSTRY FOR THE BEST CONNECTIONS IN THE WORLD!

The Best Connections in the World

DESIGNED • MARKETED BY AIRATERRA

620 PAULA AVENUE • GLENDALE 1, CALIFORNIA

AIME PROGRAM . . .

2 p.m.

Ballroom

TITANIUM METAL SYMPOSIUM—II

Status and Use of Titanium Abroad

(Speaker to be announced.)

Review of Department of Defense Sheet Rolling Program—N. E. Promisel, Navy Bureau of Aeronautics (to summarize Phases I and II), George Sachs, University of Syracuse (to summarize Phase III).

Panel: C. W. Alesch, Convair; T. H. Gray, Boeing Airplane Co.; and W. W. Wood, Chance Vought Aircraft Inc.

New Alloys

Moderator: R. I. Jaffee, Battelle Memorial Institute.

Panel: Harold Margolin, New York University; S. A. Herres, Titanium Metals Corp. of America; W. L. Finlay, Crucible Steel Co. of America; T. E. Perry, Republic Steel Corp.; and L. S. Busch, Mallory-Sharon Metals Corp.

Embassy Room

SYMPOSIUM ON NEW APPLICATIONS OF THE PHASE RULE IN EXTRACTIVE METALLURGY

Graphical Representation of Heterogeneous Ternary Equilibria—J. H. Downing, Electro Metallurgical Co.

Heterogeneous Equilibria in Multicomponent Systems—L. S. Darken, U. S. Steel Corp.

Recent Studies of Geological Materials at High Pressures and Temperatures—J. F. Schairer, Carnegie Institute of Washington.

Representation and Interpretation of Phase Equilibria in Oxide Systems Involving Changes in Oxidation States—A. Muan, Pennsylvania State University.

Derivation of the Approximate Ternary Phase Diagram Silicon-Oxygen-Carbon—W. A. Krivsky, Electro Metallurgical Co.

Quaternary Systems—R. Schuhmann Jr., Purdue University.

Lorenzo Carter Room

SYMPOSIUM ON STEELMAKING IN THE SOVIET UNION—II

Alloy Steels—Gunther Mohling, Allegheny Ludlum Steel Corp.

Rolling Mills—F. S. Eckhardt, Bethlehem Steel Corp.

Vacuum Techniques in Metallurgy—A. M. Aksoy, Crucible Steel Co. of America.

Observations on the Direction of Steelmaking Research and Development—J. F. Elliott, Massachusetts Institute of Technology.

Designed and built by . . .

UNITED

4-HIGH 4-STAND TANDEM BRASS MILL

UNITED

ENGINEERING AND FOUNDRY COMPANY

PITTSBURGH, PENNSYLVANIA

Plants at Pittsburgh, Vandergrift, Youngstown, Canton, Wilmington

SUBSIDIARIES: Adamson United Company, Akron, Ohio
Stedman Foundry and Machine Co., Inc., Aurora, Indiana

Designers and Builders of Ferrous and Nonferrous Rolling Mills, Mill Rolls, Auxiliary Mill and Processing Equipment, Presses and other heavy machinery. Manufacturers of Iron, Nodular Iron and Steel Castings and Weldments.

Build Quality in Your Line with

BISHOP TUBING AND PLATINUM PRODUCTS

"Metals for Precision and Performance"

Quality begets quality — it's an established axiom that premium products must begin with quality components. BISHOP has been producing platinum and precious metal products since 1842 . . . *precision* stainless steel tubing since 1931. The BISHOP family of metal products includes a broad variety of components for the designer, engineer . . . just to mention a few:

Capillary Tubing—stainless grades, standard sizes up to .130" OD
Platinum & Platinum Alloy Wire—#50 to #3 B & S Gauge
Clad Metals—base and precious metals in various combinations
Glass-To-Metal Sealing Alloys—low expansion alloys
Thermocouple Wire—noble metal and noble metal alloys
Tubing—nickel, stainless, platinum, special alloys up to 1" OD
Tubular Fabricated Parts—all varieties—conventional forming operations
Composite Wires—base and precious metals in various combinations
Platinum Contacts, Discs, Laboratory Apparatus

CATALOGS, DATA SHEETS SENT PROMPTLY ON REQUEST

Begin your next design with *unexcelled* quality BISHOP component materials. Write, wire or phone Malvern 3100.

J. BISHOP & CO.
platinum works
MALVERN, PENNSYLVANIA

AIME PROGRAM . . .

Oak Room

DEFORMATION—II

Slip in Aluminum-Silver Single Crystals —A. Kelly, A. Lassila, and S. Sato, Northwestern University.

Experimental Observations of Some Dislocation Sources—J. J. Gilman, General Electric Co.

Photographic Evidence of Frank-Read Dislocation Sources in Zinc—V. Damiano and M. Herman, Franklin Institute.

Dislocation Behavior During Creep of Silver — The Initial Creep Period — M. S. Abrahams and E. S. Machlin, Columbia University.

Flow Stress of Iron and Its Dependence on Impurities—G. C. Schoeck, Westinghouse Electric Corp., and A. Seeger, Max Plank Institut fur Metallforschung, Stuttgart, Germany.

Effect of Changes in Slip Direction on the Creep of Magnesium Crystals—Hans Conrad, Westinghouse Electric Corp.

Activation Energies for Creep of Single Aluminum Crystals Favorably Oriented for Cubic Slip—Y. A. Rocher, L. A. Shepard, and J. E. Dorn, University of California.

Factors Affecting Ductility and Strength of NaCl Single Crystals Tested in Flexure—C. A. Stearns, A. E. Pack, and R. A. Lad, NACA.

Wednesday, Oct. 29—9 a.m.

Ballroom

SYMPOSIUM ON OXIDATION PROTECTION AND FABRICATION

Nucleation and Growth of Chromium on Molybdenum in Liquid Metal Solutions—J. Wulff and S. T. Wlodek, Massachusetts Institute of Technology.

Metallic Coatings for Molybdenum — G. D. Oxx, General Electric Co.

Arc Melting and Fabrication of Tungsten—S. J. Noesen, J. R. Hughes, C. L. Kolbe, and R. C. Leech, General Electric Co.

Orientation of Large Grains in Annealed Tungsten Wire—A. J. Opensky, Sylvania Electric Products Inc.

Arc Melting, Fabrication, and Annealing of Tantalum to Produce Foil—S. J. Noesen, M. A. Cocca, and R. C. Leech, General Electric Co.

Oak Room

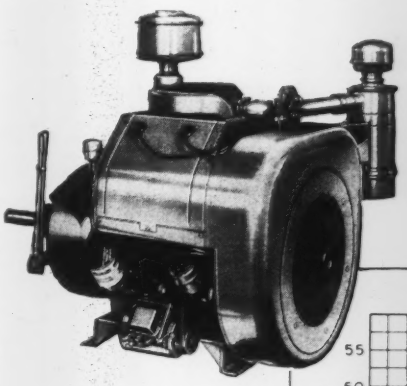
HIGH-PURITY METALS

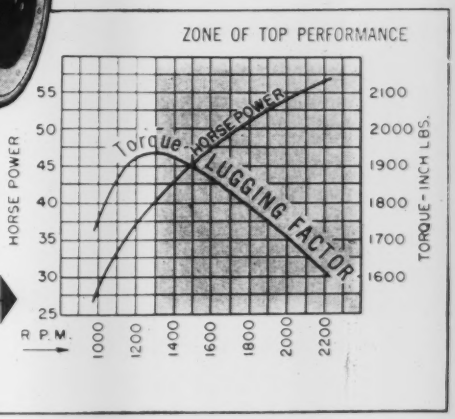
Growth of Molybdenum, Tungsten, and Columbium Crystals by Floating Zone Melting in Vacuum—E. Buehler, Bell Telephone Laboratories Inc.

Determination of the Limiting Segregation of Gallium in Zone-Refined Ger-

Judge your power unit by its

LUGGING FACTOR!





consider this
Model VR4D 56 hp
WISCONSIN
heavy duty Air-Cooled
ENGINE *power curve*
(Other models, 3 to 56 hp.)

When the power load suddenly *builds up* and the engine speed *slows down* . . . how long will the engine *hang on* and carry the increased load without stalling?

The answer lies in the HIGH TORQUE LUGGING FACTOR which is an integral part of "Wisconsin" basic engineering. The point at which an engine will stall under suddenly increased loads is the *High Point* in the TORQUE CURVE. As a case in point, analyze the Wisconsin Model VR4D power curves reproduced here.

This engine develops its maximum horsepower (56 hp.) at 2200 rpm. at which point it registers a torque of 1600 inch-lbs. The engine runs into heavy going. The load builds up fast. The rpm. slows down to 2000, 1800, 1600 and 1400 rpm., reaching its maximum torque *at the low speed* of 1300 rpm.

In terms of power service to the user, this simply means that your Wisconsin Engine is designed *to provide dependable load-holding power at low engine speeds.* This, in turn, means fewer shutdowns, less wear and tear, more usable power and more versatile performance for your dollar investment.

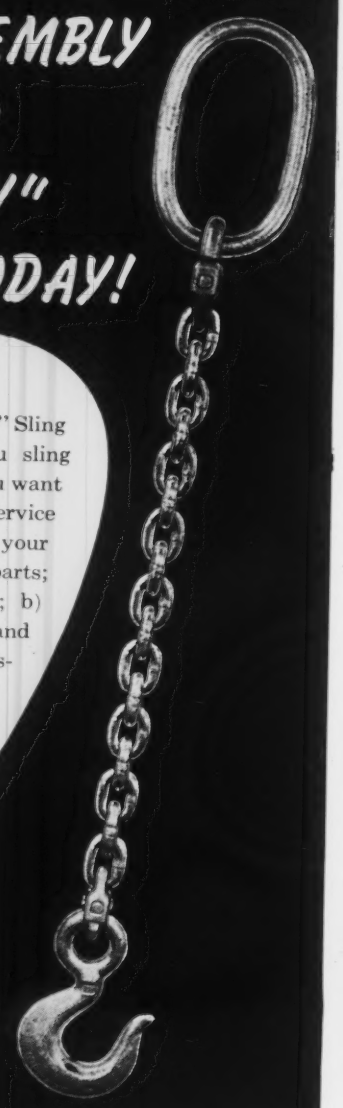
These are reasons why it pays to specify "Wisconsin Power" for your equipment. For a briefing on the full line (3 to 56 hp.), write for Engine Bulletin S-223.

WISCONSIN MOTOR CORPORATION
World's Largest Builders of Heavy-Duty Air-Cooled Engines
MILWAUKEE 46, WISCONSIN

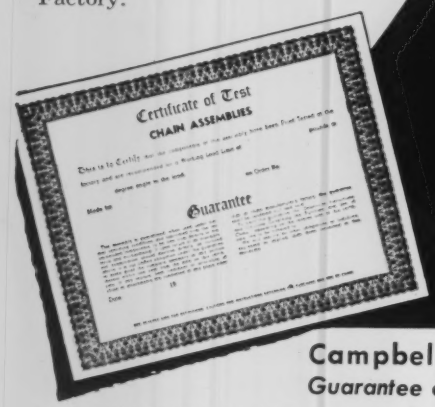
A8-6218-3½A2

Campbell "Customized" Sling Chains

PUT THE ASSEMBLY YOU NEED "YESTERDAY" ON THE JOB TODAY!



Now, the new Campbell "Customized" Sling Chain Assembly Program gives you sling chains as you want them . . . when you want them. Here's how this fast, flexible service works for you. You can: a) maintain your own stock of Campbell component parts; and assemble slings right on-the-job; b) get immediate delivery on assemblies and components from your Campbell Distributor; c) get immediate shipment ordered through your Campbell Distributor on slings made-up at the nearest Campbell Warehouse or Factory.


Certificate of Test
CHAIN ASSEMBLIES
Guarantee

Campbell Certificate of Test:
Guarantee of Performance

Campbell Certificates of Test protect you both for Campbell component parts, and the complete "Customized" Assemblies you get from your Campbell Chain Distributor or Warehouse. Call your Distributor for details on how the Program meets the requirements of *your* operation.

SEND TODAY for your free copy of Campbell's "Customized" Sling Chain Brochure No. CSA-1.

CAMPBELL CHAIN

CAMPBELL CHAIN *Company*

York, Pa.—W. Burlington, Iowa
E. Cambridge, Mass.—Seattle, Wash.—Portland, Ore.
Sacramento, San Francisco, Los Angeles, Calif.

AIME PROGRAM . . .

manium—L. W. Davies, Commonwealth of Australia.

Zone Melting of Magnesium—A. S. Yue, Dow Chemical Co.

Embassy Room

PRECIPITATION AND SEGREGATION

Metallographic Study of Precipitation of Silicon from a Supersaturated Al(Si) Solid Solution—H. S. Rosenbaum, General Electric Co.

Acoustical Study of G. P. Zone Formation after Reversion in Al-20% Ag—Herbert Herman and M. E. Fine, Northwestern University.

Critical Particle Size for Precipitation Hardening—J. D. Livingston, General Electric Co.

Correlation Between Subboundaries and Impurities in Superpurity Aluminum—D. Altenpohl, Aluminum Foils Inc.

Lorenzo Carter Room

SYMPOSIUM ON CERAMIC BASE ELEMENTS

Fabrication of Ceramic Fuel Elements by Swaging—D. R. Stenquist, R. J. Anicetti, General Electric Co.

Pressure Bonding of Zircaloy-Clad Flat-Plate Uranium Dioxide Fuel Elements—S. J. Paprocki, E. S. Hodge, and D. C. Carmichael, Battelle Memorial Institute.

Fabrication of Aluminum-Plate-Type Elements Containing Uranium Dioxide as the Fuel — S. I. Megeff and J. L. Sambrow, Sylvania-Corning Nuclear Corp.

Stainless Steel-Uranium Dioxide Fuel Components for Army Package Power Reactor—J. E. Cunningham and R. J. Beaver, Oak Ridge National Laboratory.

Preparation of Zirconium-Base Dispersion Fuels—A. P. Beard and R. N. Honeyman, General Electric Co.

Fabrication and Properties of Uranium-Zirconium Hydride Fuel Elements for Triga Reactors—W. P. Wallace, M. T. Simnad, and B. Turovlin, General Dynamics Corp.

Wednesday, Oct. 29—2 p.m.

Lorenzo Carter Room

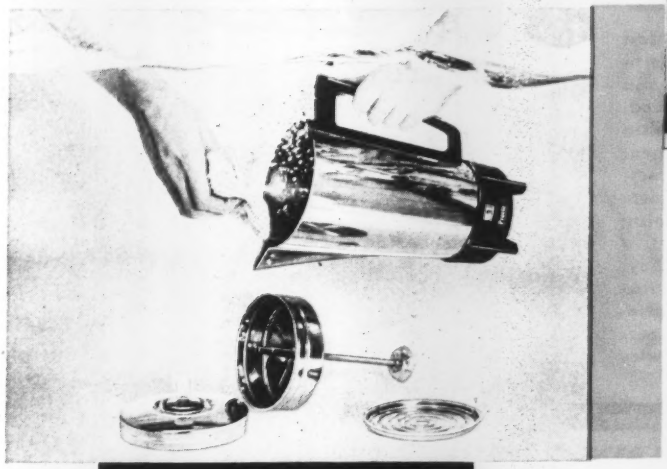
SYMPOSIUM ON METAL BASE FUELS AND JACKET COMPONENTS

Silicon-Modified Uranium-Aluminum Alloys for Foreign Reactor Applications—W. C. Thuber and R. J. Beaver, Oak Ridge National Laboratory.

Fabrication of Iron-Aluminum-Chromium Alloy Fuel Plates—F. G. Tate, J.

Blending an Idea with STAINLESS

Photo, courtesy National Presto Industries, Inc., Eau Claire, Wis.



THE HOUSE OF STAINLESS Helps Manufacturer Select the Right Stainless to Produce the First Submersible Automatic Coffeemaker!

Have a new product idea? Looking for possible avenues of improvement in existing products? Chances are you can save time, trouble and money by talking over your needs with CSS specialists.

The experience of Presto engineers is typical. They had an idea—an automatic coffeemaker that could be completely submerged in water for thorough cleaning! Stainless steel was their choice of material. Because it wouldn't impart a taste to the coffee. Because it provided a permanent, gleaming finish—easy to clean, always free of corrosion. And because its strength assured long service life. But which of the many types of stainless should they use?

For the answer, they consulted Chicago Steel Service. After tests, a type of stainless with a high-luster mill finish and controlled hardness was selected. This material allowed for the severe draw required, and provided a high finish with minimum polishing.

Most important to you is that service at The House of Stainless is *all-inclusive*. With metallurgical help where it can do you the most good. With suggestions based on close, personal contact with users in virtually every field. Representing more than 30 leading stainless producers, CSS can supply a full range of sizes in any shape, type, grade or quantity. And complete warehouse stocks are maintained for immediate delivery.

Please phone LAfayette 3-7210

CHICAGO STEEL SERVICE COMPANY

Kildare Avenue at 45th Street, Chicago 32, Illinois—Mailing Address—Box No. 6308, Chicago 80, Illinois

Milwaukee District Office: 757 N. Broadway, Milwaukee 2, Wisc. Telephone: BRoadway 3-7874
Sales Representatives at Bloomington and Rockford, Illinois • Indianapolis and South Bend, Indiana
Davenport, Iowa • Grand Rapids, Michigan • Minneapolis, Minnesota • Appleton, Wisconsin

YOUR DEPENDABLE SOURCE FOR BOTH CARBON AND STAINLESS STEEL

COWLES

ROTARY KNIVES

SLITTING KNIFE

TRIMMING KNIFE

Specify Cowles—world's largest manufacturer of rotary knives—to get more tonnage per grind, and cut production costs. Our exceedingly high standards of precision manufacture and exacting heat treatment assure utmost accuracy, efficiency and long life. Complete line including slitting, trimming and specially engineered knives, in our **Max-cut; Specialloy; Superalloy; Circle C** and **Super C** grades—also carbide knives — for any requirement. Prompt delivery. Engineering help on any job. **Let Cowles quote on your requirements.**

CARBIDE KNIFE

SPACER

Write for Bulletin No. 571 Today!

COWLES TOOL COMPANY

2050 WEST 110th STREET, CLEVELAND 2, OHIO

REPRESENTATIVES IN ALL PRINCIPAL CITIES

Handling Coil Stock?

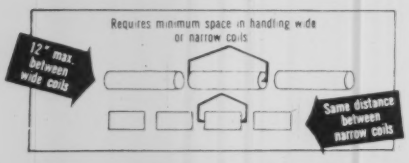
CHECK THESE

C-F LIFTER

ADVANTAGES

- **1 Lifter handles wide range of coil sizes**
- **Requires minimum of only 10" to 12" between piles —saves storage room**
- **1 man operation — eliminates hookers**
- **Positive grip on coil — no damage to material**

• C-F Coil Lifters are saving time and labor in many plants and warehouses because they can pick up, carry and set down a coil of steel faster and safer than any other method. Infinite jaw openings permit handling a very wide range of coil widths . . . carrying legs open fast, stay open until operator closes them on coil. Narrow legs require minimum space between piles —a space saving advantage. Made in motorized models for crane cab or pendant operation as well as manual types with chain wheel, in capacities from 3 tons up. Powered Rotating Heads available. Opening ranges to suit your requirements. Write for illustrated Bulletin.



CULLEN-FRIESTEDT CO.

1308 South Kilbourn Avenue • Chicago 23, Illinois

AIME PROGRAM . . .

Neri, and Blake King, Martin Co.

Fabrication of Zircaloy-2 Clad Uranium 12% Molybdenum Fuel Rods—J. G. Goodwin, R. W. Tombaugh, E. L. Richards, and F. R. Lorenz, Westinghouse Electric Corp.

Manufacture of EBR-I, Mark III Fuel and Blanket Elements—R. A. Noland, N. J. Carson, C. C. Stone, R. E. Macherey, and F. D. McCuaig, Argonne National Laboratory.

Bonding of Aluminum with Elemental Silicon—R. A. Noland and D. E. Walker, Argonne National Laboratory.

Alternate Bonding Techniques for Fuel Element Components—F. L. Orrell and H. R. Hoge, Westinghouse Electric Corp.

Fuel Element Closures—J. E. Minor and S. H. Bush, General Electric Co.

Ballroom

SYMPOSIUM ON METALLURGY OF COLUMBIUM AND ITS ALLOYS

Some Physical and Mechanical Properties of Columbium and Its Alloys—R. T. Begley and L. L. France, Westinghouse Electric Corp.

Some Effects of Alloying on the Strength Properties of Columbium at Elevated Temperatures—G. D. Gemmel, E. I. du Pont de Nemours & Co.

Properties of Some Columbium Alloys—R. G. Frank, General Electric Co.

Properties of the Ternary Alloy Cb-10% Ti-10% Mo—A. H. Grobe, Thompson Products Inc. and H. B. Hix, E. I. du Pont de Nemours & Co.

Oxidation Behavior of a Columbium-Zirconium Alloy—G. M. Gordon, R. Speiser, and J. W. Spretnak, Ohio State University.

Hot Hardness Measurements of Some Columbium-Base Alloys—A. L. Eiss, L. Sama, and H. P. Kling, Sylvania-Corning Nuclear Corp.

Mechanical Properties and Oxidation Resistance of Columbium-Base Alloys—F. R. Schwartzberg, D. N. Williams, and R. I. Jaffee, Battelle Memorial Institute.

Oak Room

SYMPOSIUM ON ELECTRICAL AND MAGNETIC METALS

Magnetic Methods in Metallurgy — Anthony Arrott, Ford Motor Co.

Physical Metallurgy of Magnetic Materials—J. J. Becker, General Electric Co.

Application of Magnetic Materials—M. F. Littman, Armco Steel Corp.

Heusler Alloys—F. A. Hames, Queens University, Kingston, Ont.

(*Please turn to Page 257*)

Rolls and Rolling Mill Equipment

For more than half a century the name "Hyde Park" on Rolls and Rolling Mill Equipment has identified them as tops in excellence of manufacture, in precision of operation and in long trouble-free performance. Yes, "Hyde Park" is known throughout the industry as the mark of quality.

We will be glad to work with you in solving your mill equipment problems.

Rolling Mill Equipment

Bar Mills • Merchant Mills • Sheet and Strip Mills • Pinion Stands • Roller Tables • Reduction Drives • Stretcher Levellers • Sheet Mill Shears • Roll Lathes • Special Machinery • Machine Work

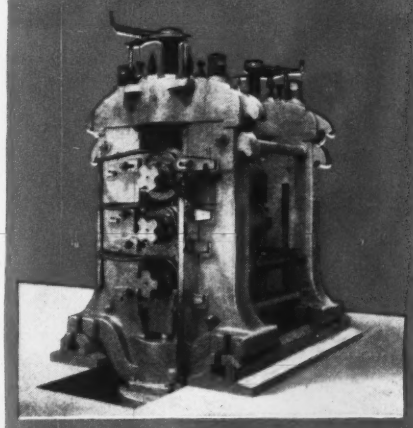
A "Red Circle" Roll for Every Purpose

Alloy Iron Rolls
Grain Rolls
Chilled Rolls
Nickel Chilled Rolls
Moly Rolls
Cold Rolls

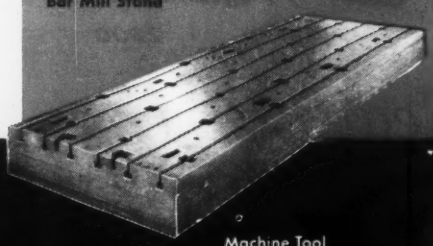
Gray Iron Castings up to 80,000 lbs.

RED CIRCLE Rolls ALLOY–CHILLED

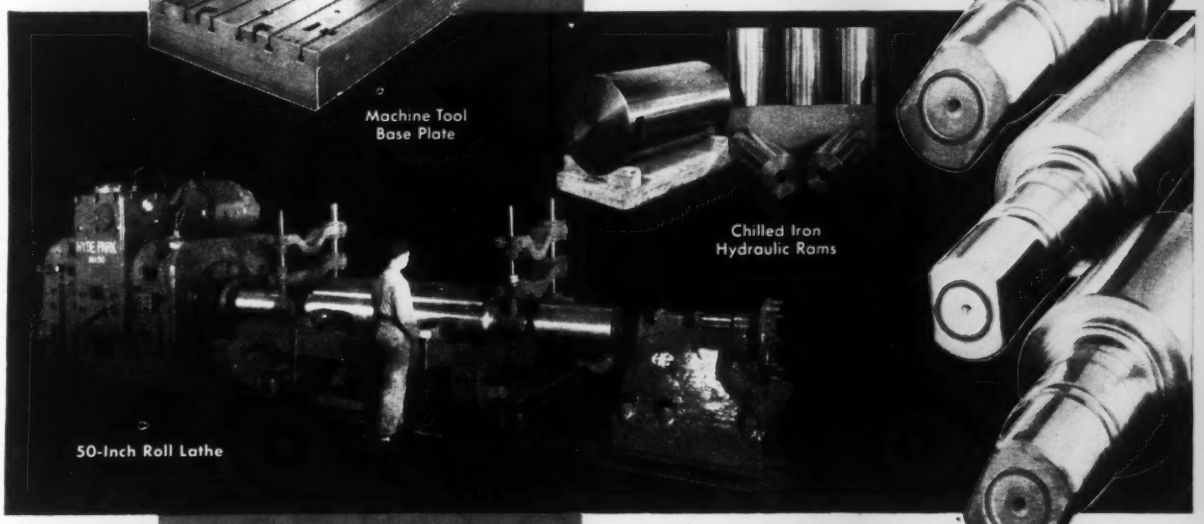
The Mark of Quality



18 inch 3 high Bar Mill Stand



Machine Tool Base Plate

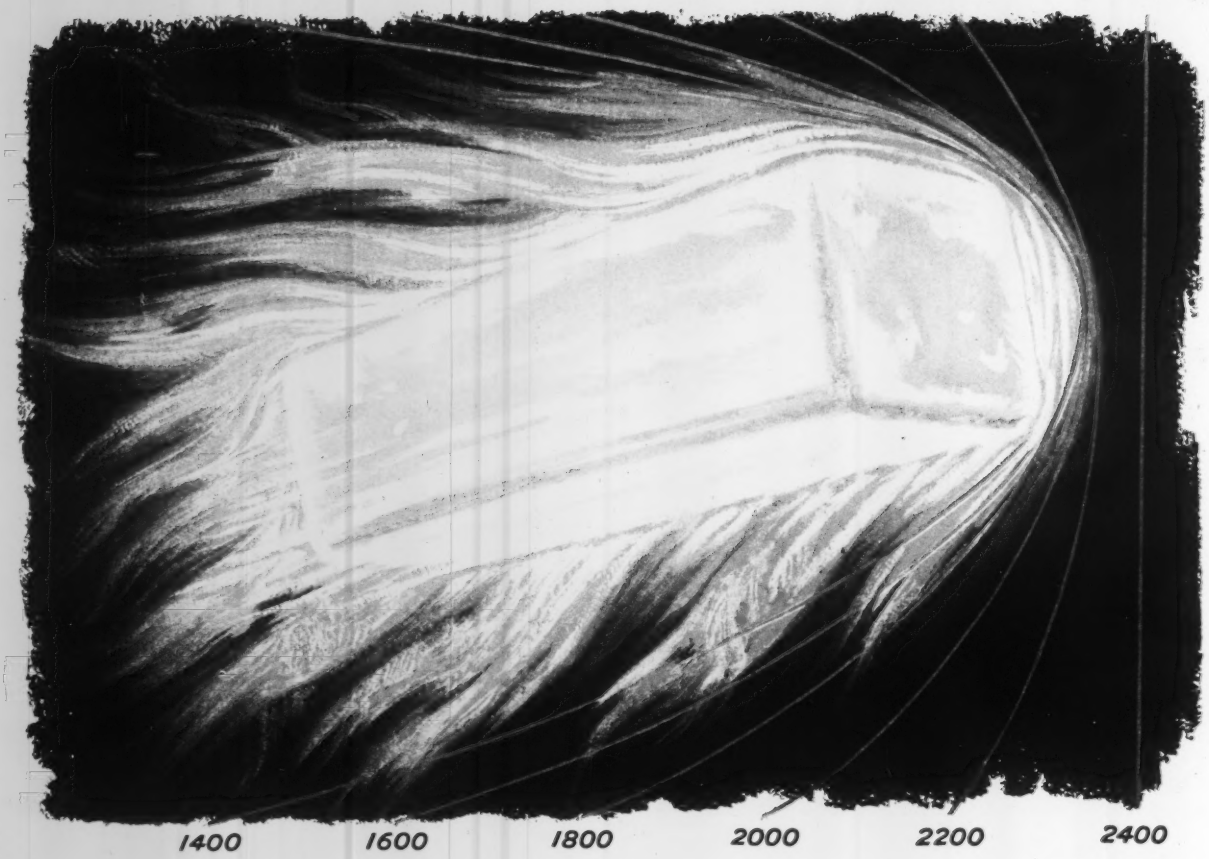


50-Inch Roll Lathe

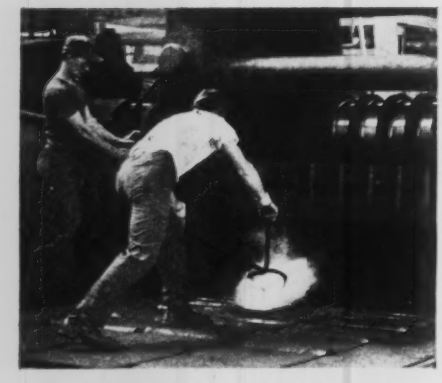
Chilled Iron Hydraulic Rams

Hyde Park FOUNDRY and MACHINE CO.

HYDE PARK, WESTMORELAND COUNTY, PITTSBURGH DISTRICT, PA.



Bending the Heat Barrier



Specialized mill equipment is available at HAYNES STELLITE for rolling high-temperature alloys into a variety of shapes and sizes. Bar (above) is being produced on a 24-inch mill.

High strength plus resistance to oxidation, creep, thermal shock, and fatigue—are some of the properties that have helped to push the heat barrier back over the past 15 years. These are the properties found in HAYNES high-temperature alloys. Properties that make these alloys very useful in the 1000 to 2000+ deg. F. range.

Typical uses? The really hot spots in jet aircraft, ramjets, and missiles are some. Furnace components, heat-treating equipment, kiln liners are others. In fact, any part where long service life under severe high-temperature conditions is essential.

There are 12 HAYNES high-temperature alloys—available immediately in convenient forms that can be readily fabricated. For information on properties and prices, write for descriptive literature.

HAYNES
ALLOYS
HAYNES STELLITE COMPANY
Division of Union Carbide Corporation
Kokomo, Indiana

UNION CARBIDE

The terms "Haynes" and "Union Carbide" are registered trade-marks of Union Carbide Corporation.

AIME PROGRAM . . .

Embassy Room

TRANSFORMATION

Correlation of Transformation Behavior with Mechanical Properties of Several Titanium-Base Alloys—A. J. Griest, J. R. Doig, and P. D. Frost, Battelle Memorial Institute.

Lattice Stability of Metals. Pt. I—Titanium and Zirconium—Larry Kaufman, Manufacturing Laboratories Inc.

Effects of Composition on Transformations in Titanium-Chromium Alloys — H. I. Aaronson, Ford Motor Co., W. B. Triplett, Carnegie Institute of Technology, and G. M. Andes, E. I. du Pont de Nemours & Co.

Effects of Aluminum on Morphology and Kinetics of Alpha Formation in a Ti-10% Mo Alloy—H. I. Aaronson, Ford Motor Co., W. B. Triplett, Carnegie Institute of Technology, and G. M. Andes, E. I. du Pont de Nemours & Co.

Relation Between Beta Grain Size and Ductility of High-Strength Alpha-Beta Titanium Alloys—A. J. Griest, A. P. Young, and P. D. Frost, Battelle Memorial Institute.

Alpha-Beta Transformation in Zircaloy-2—Josef Intrater, Materials Research Corp.

Orientation of Single Martensite Plates in Austenite—H. M. Otte, Rias Inc.

Order-Disorder Transformations in Iron-Aluminum Alloys—H. J. McQueen and G. C. Kuczynski, University of Notre Dame.

Measurement of Grain Continuity in Two-Phase Alloys—J. Gurland, Boston University.

Thursday, Oct. 30—9 a.m.

Ballroom

SYMPOSIUM ON MECHANICAL PROPERTIES AND EFFECT OF INTERSTITIALS

Dislocations in Molybdenum—R. D. Forrest and D. W. Bainbridge, Colorado School of Mines.

Effect of Variations in Carbon and Oxygen Contents on the Properties of Wrought Molybdenum-Titanium Alloys —M. Semchyshen and R. Q. Barr, American Metal Climax Inc.

Strengthening by Carbide Dispersion in Molybdenum Alloys—W. H. Change, General Electric Co.

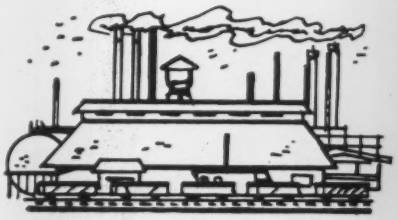
Deoxidation and Denitrification Studies of Chromium and the Effect on Low-Temperature Properties—H. L. Levingston and N. J. Grant, Massachusetts Institute of Technology.

Influence of Interstitial Content and Processing Variables on the Mechanical Properties of Columbium Metal—A. L.

(*Please turn to Page 260*)

From Process Circuits to Waste Water Disposal

Verti-Line



CUTS PUMPING COSTS

LESS SPACE

Verti-Line pumps occupy as little as 1/5 the space of ordinary horizontal pumps of similar capacity.

GREATER EFFICIENCY

Pumping efficiencies ranging to 90% mean you get maximum output with minimum power input.

LOWER MAINTENANCE COSTS

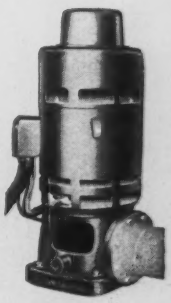
Carefully kept records prove that for over 40 years, negligible maintenance costs are the rule with Verti-Line.

NO PRIMING

Operating overhead is cut because submerged pumping element eliminates priming.

COMPLETE LINE

Verti-Line pumps range from 20 to 35,000 gpm, 1½ to 1000 H.P., and handle both corrosive and non-corrosive fluids.
Write for Bulletin J-108



Verti-Line Pumps are exclusive products of

LAYNE & BOWLER PUMP COMPANY
general offices & main plant
2943 VAIL AVENUE • LOS ANGELES 22, CALIFORNIA

NEW

from Standard Oil

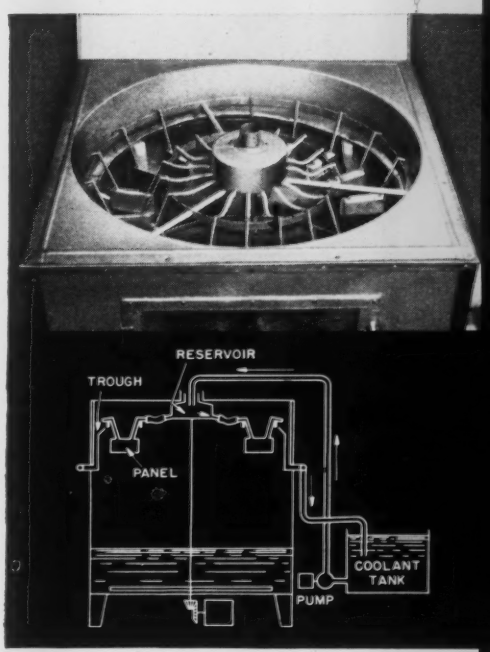
THE MAGIC BOX

Corrosion steals $5.5 billion from industry annually. Standard Oil is in the forefront of the fight to control this loss. Standard's research scientists have developed a new method for measuring the effectiveness of rust preventives. This new test takes less than one-twentieth of the time of previous tests—and is about three times as precise.

Using a controlled humidity cabinet for testing corrosion, these Standard research men installed a system for cooling metal test panels (previously treated with rust preventive) so that their surface temperatures are lower than the temperature in the cabinet. Temperatures of panel surfaces and of cabinet atmosphere are held accurately. Controlling the temperature of the panels controls the rate at which water condenses on them. This in turn (for the first time) permits accurate control of the amount of condensation on the panels. Rust preventives are more speedily and precisely tested. Science, as a result of this work, has a new tool with which to test corrosion.

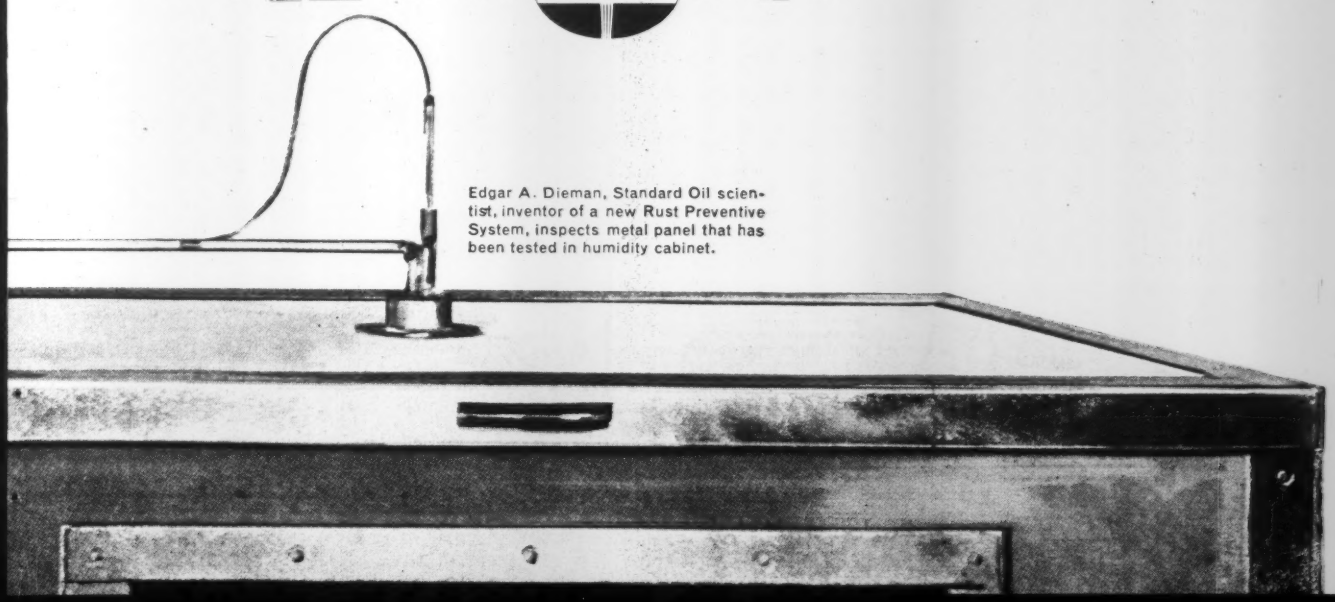
This is the research pay-out industry receives from Standard Oil. This is the something extra that backs up the Standard Oil industrial lubrication specialist who calls on you. This is the something extra found in the products he has to sell.

To know more about how Standard Oil industrial lubrication specialists—and Standard's research program—can help you, call the Standard Oil office nearest you in any of the 15 Midwest and Rocky Mountain states. Or write **Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.**

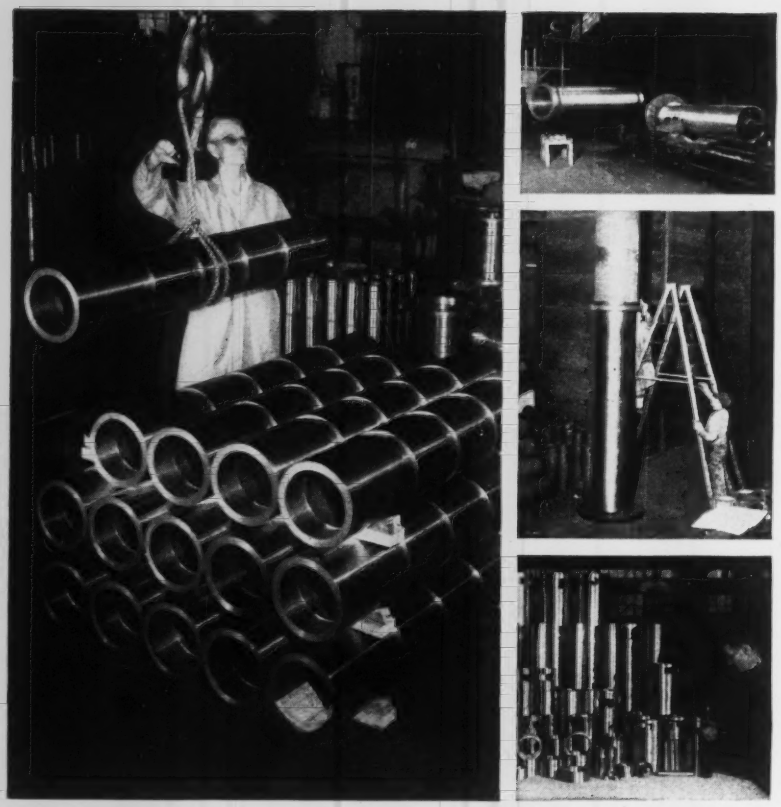


Top view and cross section of Accelerated Corrosion Test cabinet.

You expect more from STANDARD and get it!



Edgar A. Dieman, Standard Oil scientist, inventor of a new Rust Preventive System, inspects metal panel that has been tested in humidity cabinet.



You save 5 ways with

SHENANGO CENTRIFUGAL CASTINGS

By using Shenango centrifugal castings for essentially symmetrical parts, you will gain considerable savings because:

1. **The Shenango process automatically eliminates hidden defects in the metal . . . insures fewer rejects.**
2. **No patterns required . . . an important saving, particularly on special or small quantity runs.**
3. **Finer, more uniform grain structure means smoother, faster machining, better control, and a higher rate of completion.**
4. **With Shenango centrifugal method control, there's less excess metal to be machined away, less metal to buy and ship!**
5. **Because of their homogeneous, pressure-dense qualities, Shenango centrifugal castings are stronger, have better wear resistance and require less frequent replacement. Maintenance cost is cut!**

Check with Shenango on centrifugally cast parts for your needs —large or small castings . . . rough, semi-finished or precision-machined . . . ferrous or non-ferrous. They'll cost you less in the long run. For bulletins, write to: *Centrifugally Cast Products Division,* The Shenango Furnace Company, Dover, Ohio.

SHENANGO CENTRIFUGAL CASTINGS

COPPER, TIN, LEAD, ZINC BRONZES • ALUMINUM AND MANGANESE BRONZES
MONEL METAL • NI-RESIST • MEEHANITE METAL • ALLOY IRONS

AIME PROGRAM . . .

Mincher and W. F. Sheely, Electro Metallurgical Co.

High-Temperature Tensile Properties of Molybdenum and Tungsten — R. W. Hall and P. F. Sikora, NACA.

Embassy Room

DIFFUSION

Layer Growth During Interdiffusion in the Aluminum-Nickel Alloy System—L. S. Castleman and L. L. Seigle, Sylvania Electric Products Inc.

Theoretical Calculation of the Relaxation of Atoms Surrounding a Vacancy in Cubic Metals from Morse-Type Potentials—L. A. Girifalco and V. G. Weizer, NACA.

Effect of Static Strains on Solid-State Diffusion—a Theoretical Treatment—L. A. Girifalco and H. H. Grimes, NACA

Effect of Plastic Flow on Self-Diffusion in Silver—A. F. Forestieri and L. A. Girifalco, NACA.

Self-Diffusion in Tin Single Crystals—J. D. Meakin and Eric Klokholm, Franklin Institute.

Short Circuit Diffusion—G. T. Murray, Materials Research Corp. and E. S. Machlin, Columbia University.

Formation of Surface Pits by the Condensation of Vacancies—P. E. Doherty and R. S. Davis, Harvard University.

Stress-Induced Ordering Internal Friction of Iron-Aluminum Alloys—J. C. Shyne, Ford Motor Co. and M. J. Sinnott, University of Michigan.

Interstitial Stress Relaxation in Ternary Alloy Systems—D. Gupta, University of Illinois, and Sheldon Weinig, Materials Research Corp.

English Room

DEFORMATION

AND FRACTURE

Cause of Cleavage Fractures in Ductile Materials—J. Washburn, A. E. Gorum, and E. R. Parker, University of California.

Deformation Resulting from Grain Boundary Sliding—Hans Brunner and N. J. Grant, Massachusetts Institute of Technology.

Measurements of Deformation Resulting from Grain-Boundary Sliding in Aluminum and Aluminum-Magnesium Alloys from 410 to 940° F—Hans Brunner and N. J. Grant, Massachusetts Institute of Technology.

Preliminary Evaluation of the Silver Chloride-Alumina System as a Means of Studying Fine Particle Strengthening of Solids—T. L. Johnston, R. J. Stokes, and C. H. Li, Minneapolis-Honeywell Regulator Co.

(*Please turn to Page* 263)

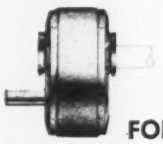
DETACHABLE MOTOR DESIGN
permits motor change in minutes
— avoids downtime for motor repairs.

Now - a MOTORIZED SPEED REDUCER FOR MOUNTING DIRECTLY ON SHAFT

IT'S THE NEW OPTIMOUNT

Ratiomotor for shaft mounting. It's the compact power package you have needed to save space without sacrifice of top transmission efficiency. Single or double reduction helical geared units deliver 87.4 to 431 output RPM. Get details—find out how OPTIMOUNT can solve your drive design problems.

the NEW BOSTON Gear® OPTIMOUNT TRADEMARK



HELICAL GEARED
REDUCTORS • RATIOMOTORS
AND FLANGED REDUCTORS

FOR SHAFT-MOUNTING . . .

OR IN STANDARD BASES FOR ANY FLOOR, WALL, OR CEILING MOUNTING POSITION

You can meet any drive conditions with OPTIMOUNT by using standard models *from stock*. Standardized, interchangeable parts permit easy adaptation to different drives. You save time in installation and maintenance, and reduce plant inventories of various types of speed reducers.

OPTIMOUNT delivers maximum power, with highest efficiency, through precision-finished helical gearing made to BOSTON Gear quality standards. Get details from your Distributor. He will demonstrate the many features that assure OPTIMUM PERFORMANCE. Boston Gear Works, 73 Hayward St., Quincy 71, Mass.

66 MODELS
FROM STOCK

680 OPTIONAL MOUNTING ARRANGEMENTS

1/6 to 15 H.P. DRIVES

For nearest Distributor LOOK UNDER "GEARS" in the 'Yellow Pages'

INDUSTRIAL DISTRIBUTORS — THE RIGHT HAND OF PRODUCTION

CALL YOUR DISTRIBUTOR

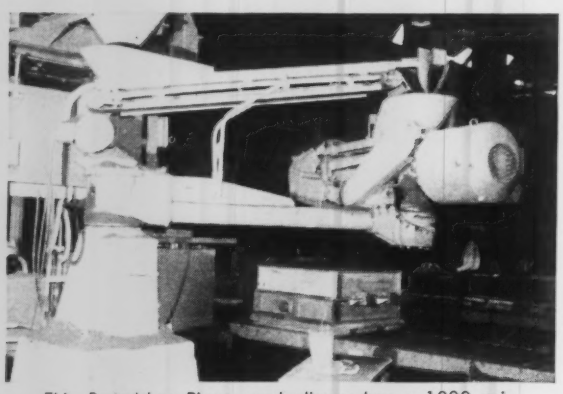
BOSTON Gear

Remember — STANDARDIZATION PAYS —

NEW CATALOG OP-1 lists complete OPTIMOUNT data—selection charts, application information.

Aeroquip Flexible Hose Lines resist vibration, shock and abrasion encountered in foundry operation.

Aeroquip Hose Lines Plus Engineering Service by Distributor Solve Equipment Installation Problem

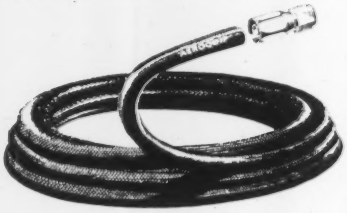


This Beardsley Piper sand slinger has a 1000 psi. hydraulic system engineered by the local Aeroquip Distributor, Faxon Engineering Company.

PHILBRICK-BOOTH & SPENCER, INC., OF HARTFORD, CONNECTICUT, RELY ON LOCAL HYDRAULIC SPECIALISTS

Installation of a new sand slinger in the foundry of Philbrick-Booth & Spencer, Inc. required the addition of a 1000 psi. hydraulic system. Engineering and installation problems were solved when the foundry called in Faxon Engineering Company, Hartford distributor of Aeroquip Hose Lines. Faxon engineers designed and installed a hydraulic system using Aeroquip Hose and Reusable Fittings. The system has proved trouble free.

The Aeroquip Distributor, listed in your Yellow Page Phone Book, is best qualified to assist you with all industrial fluid line problems in your plant. Call him first!



Aeroquip

REG. TRADEMARK

AEROQUIP CORPORATION, JACKSON, MICHIGAN

INDUSTRIAL DIVISION, VAN WERT, OHIO • WESTERN DIVISION, BURBANK, CALIFORNIA

AEROQUIP (CANADA) LTD., TORONTO 19, ONTARIO

LOCAL REPRESENTATIVES IN PRINCIPAL CITIES IN U.S.A. AND ABROAD • AEROQUIP PRODUCTS ARE FULLY PROTECTED BY PATENTS IN U.S.A. AND ABROAD

AIME PROGRAM . . .

Effect of Liquid Metal Environments on the Fracture Strength of Solid Copper—D. A. Kraai, D. V. Ragone, and E. E. Hucke, University of Michigan.

Temperature Dependence of the Tensile Properties of Face-Centered Cubic Metals—R. P. Carreker Jr., General Electric Co.

Initiation of Tensile Fracture in Ductile Metals—H. C. Rogers, General Electric Co.

Stress Analysis of the Bausch-Type Shear Test—W. L. Phillips Jr., Dana Young, and W. D. Robertson, Yale University.

Lorenzo Carter Room

SYMPOSIUM ON
POWDER METALLURGY

High-Purity Tantalum—R. F. Rolsten, E. I. du Pont de Nemours & Co.

Oxidation Resistance and Fabricability of Molybdenum-Nickel Dispersion Alloys—E. S. Bartlett, D. N. Williams, and R. I. Jaffee, Battelle Memorial Institute.

Effect of Sintering Treatment on Electropotential and Strength of Carbonyl Iron—Bennett Bovarnick, Watertown Arsenal.

Some Properties and Metallography of Steel-Bonded Titanium Carbide—Martin Epner and Eric Gregory, Sintercast Corp. of America.

Highlights of the Third Plansee Seminar in Reutte Tyrol—Werner Leszynski, Schwarzkopf Development Corp.

Thursday, Oct. 30—2 p.m.

Lorenzo Carter Room

SYMPOSIUM ON
LIQUID PHASE SINTERING

IHEA
Industrial Heating Equipment Association

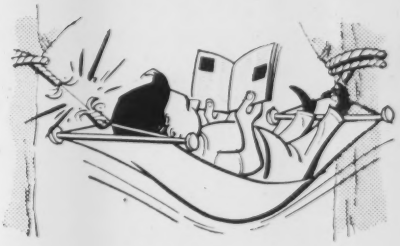
Tuesday, Oct. 28—9 a.m.

ENGINEERING & TECHNOLOGICAL DEVELOPMENT IN INDUSTRIAL HEATING PROCESSES

Engineering & Economic Elements in the Choice of Industrial Heating Equipment—C. F. Olmstead, Lee Wilson Engineering Co.

(Please turn to Page 266)

Don't wait
till you need
Dependability-



Get it *now*
with

H & S Helical Gears

H & S Helical Gearing with overlapping tooth action is your ideal choice for power transmission on parallel shafts where speeds are high, where loads are high, and where smooth action is desired. Here's why —

- Correct machining of blank and accuracy of tooth generation reduce impact and increase load carrying capacity.
- Extra heavy rims, arms and hubs provide greater strength and stability.

H & S Helical Gears are available with diameters up to 125″, 1 D.P. and 40″ face.

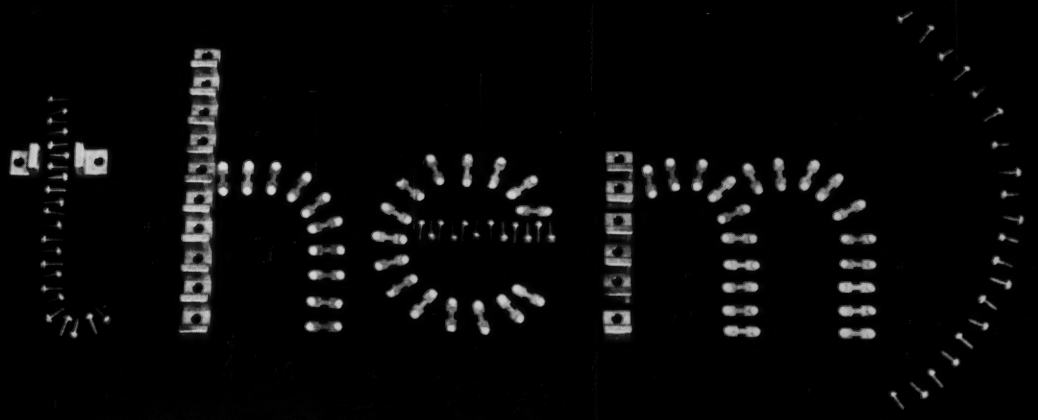
It will pay you to learn more about the extra quality built into every H & S Gear. Send us your requirements. Quotations will be forwarded by return mail.

Send for your free copy of H & S Gear Catalog No. 57.

THE HORSBURGH & SCOTT CO.
GEARS AND SPEED REDUCERS
5112 Hamilton Avenue
Cleveland 14, Ohio

COLVIN

Here are 244 overhead crane control parts that you'll never have to buy, inventory, or replace if you have P&H electronic "stepless" crane control!



These are wearing parts from the switch gear in an AC overhead crane. They are the most frequently replaced parts on most overhead cranes. Besides their original cost, they are a source of downtime, production delay, and maintenance labor costs.

These parts have been eliminated from P&H's new Electronic "Stepless" Control and replaced with a wiring circuit requiring no maintenance.

Interested? Write Dept. 130E, Harnischfeger Corp., Milwaukee 46, Wisconsin.

P&H HARNISCHFEGER
... quality and service for 74 years

ROLOCK

SPECIALIZED WELDED HEAT AND CORROSION RESISTANT FABRICATIONS

OUR EXPERIENCED FIELD SERVICE ENGINEERS EXPEDITE YOUR "SPECIALS"

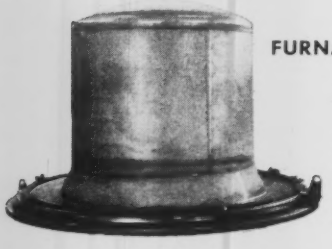
Rolock experts in welded alloy fabrication are ready to go anywhere at any time to aid in designing equipment to meet special service requirements. Rolock service is based on a well-rounded coordination of experienced design and supervisory engineering, extensive modern manufacturing facilities, inspection and test equipment.

Alternatively, send us an outline of your requirements for our recommendations or for quotations to your specifications.

Special INCONEL High Temperature Vacuum Retort approximately 2 ft. in diameter by 8 ft. high.

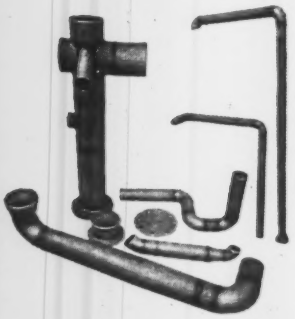
VACUUM RETORTS

We have the facilities and experienced personnel to handle your requirements in special vacuum retorts welded-fabricated from Nickel, Inconel, or other special alloys. Rolock assures experienced engineering supervision and production in a modern plant fully equipped for inspection and testing as well as fabrication.



FABRICATED ALLOY HIGH VACUUM FURNACE BELLS AND BASES

Illustration shows one of many special large fabrications typical of this type of equipment made by Rolock. This bell is of ⅜" Inconel and, together with its base, incorporates a number of unusual features. Rolock is equipped to build and test such equipment to customer's exact specifications.



WELDED-FABRICATED INCONEL SPECIAL TUBING AND FLANGES

Illustrated are typical special tubing and flange forms fabricated by Rolock to customer's specifications. Special equipment and skills required for this type of work are available at Rolock, together with engineering assistance when required.

SALES AND SERVICE REPRESENTATIVES FROM COAST TO COAST

ROLOCK INC., 1262 KINGS HIGHWAY, FAIRFIELD, CONN.

JOB-ENGINEERED for better work
Easier Operation, Lower Cost

13RL58

IHEA PROGRAM . . .

Vacuum as a Furnace Atmosphere — L. W. Johnson, General Electric Co.

Austempering, Martempering, and Isothermal Heat Treating in Basic Industry—A. F. Holden, A. F. Holden Co.

Improvements in Induction Heating — W. E. Benninghoff, Ohio Crankshaft Co.

METAL POWDER INDUSTRIES
Federation Session on
Engineering Aspects of Powder Metallurgy Structural Components

Wednesday, Oct. 29—2 p.m.

Hotel Cleveland, Cleveland Room

Moderator: George A. Roberts, President, MPIF.

Introductory Remarks—Kempton H. Roll, executive secretary, MPIF.

Tolerances—Robert Burgess, Burgess-Norton Mfg. Co.

Properties—George Stern, American Sinteel Corp.

Design—Peter Schneider, International Business Machines Corp.

Summation—George A. Roberts.

METAL TREATING INSTITUTE
Session on Heat Treating

Thursday, Oct. 30—9:30 a.m.

Hotel Cleveland

Chairman: Michael Soviak, Commercial Steel Treating Co.

Limiting Distortion of High-Strength Steels With Simple Tempering Fixtures —Fred Heinzelman Jr., Fred Heinzelman & Sons.

Heat Treatment in a Vacuum—R. C. Gross, Kinetics Corp.

Expected Variation in Hardenability of AISI 4142 Steel—Charles F. Lewis, Cook Heat Treating Co. of Texas.

Mysterious Failures in Heat Treating and Their Solution—Horace C. Knerr, Metlab Co.

Special Libraries Assn.

Thursday, Oct. 30—9:30 a.m.

Lewis Flight Propulsion Laboratory (NACA) 2100 Brookpark Rd., Cleveland, Ohio.

Registration and welcome.

Research on materials for aircraft nuclear reactors.

Research on materials for powerplants for aircraft.

Movie on high-temperature materials research.

Friday, Oct. 31—9:30 a.m.

Public Auditorium

Metals Meet the Competition — Grant Clark, Reynolds Metals Co.; A. B. McKee, Aluminum Co. of America; F. A. Loebach, Kaiser Aluminum & Chemical Sales Inc.; and J. D. Briggs, Bethlehem Steel Co.

Easy to Operate

The New

COFFING Quik Lift

COIL CHAIN ELECTRIC HOIST

The new, lightweight Coffing Quik-Lift coil chain electric hoist was designed with the convenience and safety of the operator in mind. Mechanically interlocked push-button controls are mounted in a non-conducting plastic station, and control circuits are 115 volt, regardless of hoist voltage. The control station is shaped as a hand grip for convenience in pulling the hoist along on a trolley—the control cord incorporates a strain cable.

An easily adjusted limit switch is provided to control both upper and lower limits of hook travel, and the instantaneously releasing brake gives pinpoint control of the load. Sealed-in, lifetime lubrication cuts down time-consuming maintenance. Gear trains are packed in grease, eliminating any danger of oil drips on the payload.

The Coffing Quik-Lift is designed for convenient, economical operation, with protection for both operator and hoist. For complete details on this hoist, consult your distributor or write for Bulletin ADH-65.

- Capacities ¼ to 2 Tons
- Interlocked Push-Button Controls
- Lightweight for Easy Portability
- Convenient Operation
- Accessibility

COFFING HOIST

DIVISION OF

DUFF-NORTON COMPANY

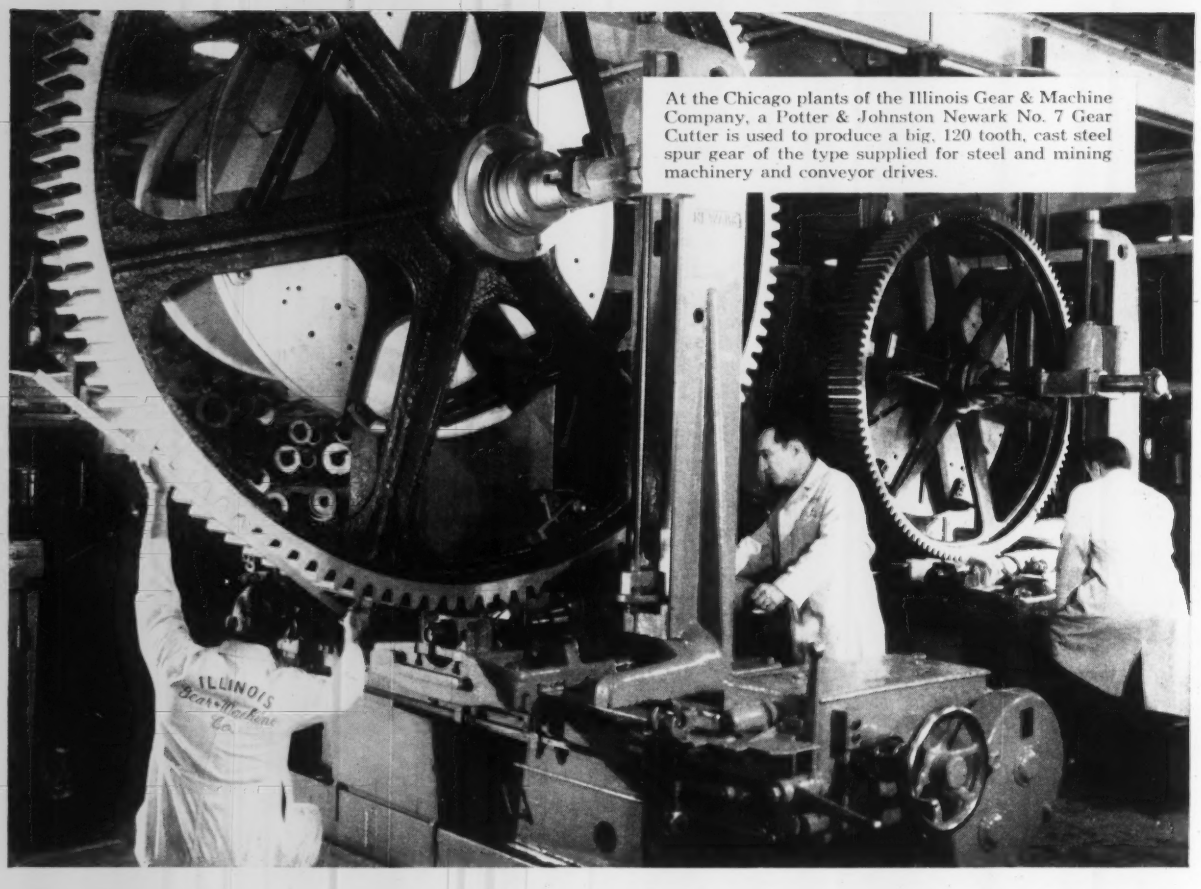
800 Walter Street · Danville, Illinois

DUFF-NORTON

Load Binders

Ratchet Lever Hoists

Chain Hoists



At the Chicago plants of the Illinois Gear & Machine Company, a Potter & Johnston Newark No. 7 Gear Cutter is used to produce a big, 120 tooth, cast steel spur gear of the type supplied for steel and mining machinery and conveyor drives.

For Speed . . . Accuracy . . . Economy . . .

ILLINOIS GEAR & MACHINE COMPANY USES NEWARK AUTOMATIC GEAR CUTTERS . . .

for spur gears with diameters ranging from ¾" to 126"

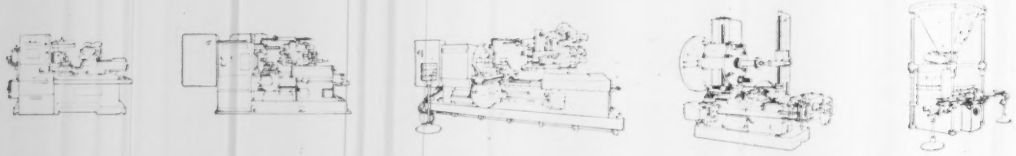
CHOICE OF THE SPECIALISTS WHO *KNOW*

. . . P&J-Newark Gear Cutters combine speed, accuracy, dependability and economy. Outstanding features include: power and rigidity for fast, heavy duty cutting; quick, easy machine setup; fully automatic operation that assures maximum output and lowest per-piece costs; and the exclusive Newark "Master Wheel" indexing mechanism, guaranteed for accuracy.

Available in four models with spur gear diameter capacities ranging from ¾" to 126".

SEND NOW FOR COMPLETE INFORMATION

. . . and see how a P&J-Newark can bring new efficiency to your gear cutting operations. Write now for your copy of Bulletin No. 157 . . . or to arrange for one of our representatives to visit you and provide facts and recommendations. Potter & Johnston Company, Pawtucket, Rhode Island.



AUTOMATIC TURRET LATHES . . . GEAR CUTTERS . . . PACKAGING MACHINES

POTTER & JOHNSTON

SUBSIDIARY OF PRATT & WHITNEY COMPANY, INC.

PRECISION PRODUCTION TOOLING SINCE 1898

Guard for Mild Steel

Process provides sheet metal with corrosion resistance usually found only in stainless

APPLYING Nicrocoat metal alloy to a base metal provides resistance to oxidation, abrasion, and corrosion.

The developer, Stainless Processing Div., Wall Colmonoy Corp., Detroit, says the alloy gives sheet metal parts (mild steel and other low cost metals) the resistance usually found only in high alloy metals and stainless steels.

It is readily applicable to thin sections, formed members, and nonmachined components, and will protect such readily oxidizable materials as molybdenum and columbium, the company says.

Bonded by Heat—A thin coating of the alloy is applied by cold spraying, dipping, or brushing to the base metal that requires protection. This is done following part fabrication. The alloy is then bonded by heating to a specified temperature under controlled conditions in a pure, dry, hydrogen atmosphere furnace.

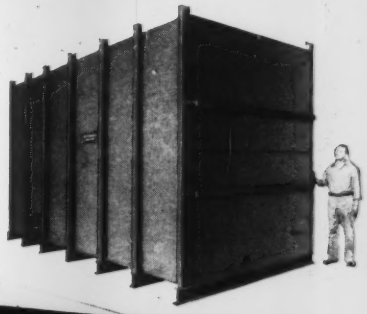
It is furnished as a powder and is mixed with Nicrobraz cement. Thickness of the coat varies from 0.002 to 0.010 in. depending on the thickness of base metal, design of part, and anticipated service requirements.

Three of the high-nickel base alloys are available: No. 1 for maximum oxidation, abrasion, and corrosion resistance (recommended bonding temperature of 2150° F); No. 2 for applications where the bonding temperature must not exceed 1950° F; and No. 3 for extremely thin base metal sections (0.015 in. or less thick). With the No. 3 alloy, coating thickness is limited to 0.002 to 0.005 in. (bonding temperature is 1800° F).

Work on Nickel, Cobalt

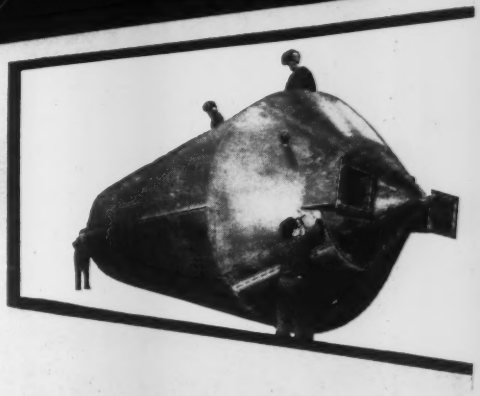
Studies to develop efficient methods for separating and recovering nickel and cobalt as separate products, and for preparing high-purity nickel, will receive special emphasis in a research program of the U. S. Bureau of Mines. Begun July 1,

BINS



TANKS

HOPPERS



• for storage or process • lined or unlined

Whether the tanks, bins and hoppers you need are tiny or titanic . . . Kirk & Blum has the "know-how" and the facilities to fabricate them to your exact specifications.

Plant facilities will accommodate sheet, plate and structural to ½" thicknesses. Overhead crane capacity to 25 tons handles the big jobs easily.

Kirk & Blum craftsmen have more than 50 years experience in mild steel, stainless, aluminum and other alloys.

Be sure to send your prints to Kirk & Blum for prompt quotation.

50 YEARS OF SERVICE

KIRK & BLUM

The Kirk & Blum Manufacturing Co.
3226 Forrer Street
Cincinnati 9, Ohio

the program is being carried on at four experimental stations.

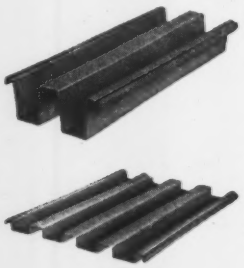
Extraction and separation of nickel, cobalt, chromium, iron, and other metals from laterite, serpentine, and related ores will also continue. Researchers will also try to extract accessory minerals.

Precise procedures for determining nickel, cobalt, and iron in their various states of oxidation, in their ores and metallurgical products, will be developed.

In an effort to conserve mineral resources, the use of multicomponent, high temperature, alloy scrap as the basic raw material in preparing standard nickel-base and cobalt-base alloys will be studied. Extraction of nickel, cobalt, molybdenum, and tungsten from low-grade ores by bacterial action will also be researched.

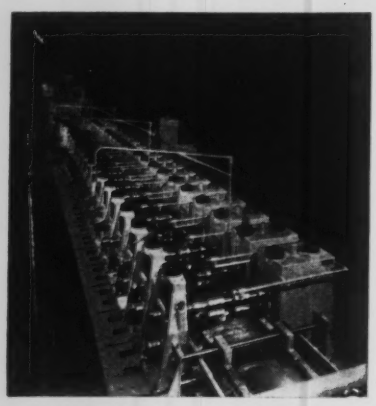
Studies will be accelerated to develop data on those physical and mechanical properties which have the greatest significance for cobalt's economical and efficient use.

Steel Roof Decks and Flooring cold rolled up to 200 f.p.m. on this mammoth



AMERICAN ROLLER DIE CORP.
ARDCOR

ROLL FORMING MACHINE



ARDCOR Roll Forming Machines feature: Unit Design—spindles in self-contained SEPARATE HOUSINGS, with speed reducers; Large Range of Vertical Centers; Double Bearing Design of Drive Housings; All Bearings are Anti-Friction; Micrometer Type Dials and Scales.

This entire automated production line is 15 ft. wide, 6 ft. high and 120 ft. long with total equipment weighing approximately 175 tons. Mill stands are completely moveable, having 4½ in. dia. spindles with 42 in. roll space.

Fed by 20,000 lb. steel coils, the twenty-two roll passes form the 1½ in. deep by 2 ft. wide sections. The mill operator controls the loading, lining-up and feeding of the coil stock from a control bridge at entry of the mill. A 150 ton Straight Sided ARDCOR Press cuts off sections to proper lengths.

ARDCOR Roll Forming Machines, are available in six standard sizes, other sizes to customer specifications.

If your products can be cold roll formed, ARDCOR engineers can supply advancements in design and construction to produce them better . . . at greater speeds and profit!

Consult our Engineering Facilities, without obligation . . .

American **ROLLER DIE CORP.**
29520 Clayton Avenue **Wickliffe, Ohio**

ARDCOR Engineered MEANS BETTER COLD ROLL FORMING

DESIGNERS, ENGINEERS AND BUILDERS: Single Roll Forming Machines or Completely Automated Production Lines for Cold Forming, Ferrous and Non-Ferrous Electric Weld and Lock Seam Tube Mills • Forming Rolls, Tubing and Pipe Rolls • Straightening, Pinch and Leveller Rolls • Cut-Off Machines • Slitters

Stiffer Weldments

Two firms making grinders say weldments provide satisfactory performance in structural parts

"WE HAVE found that welded bases for grinders are strong and free from resonant vibrations," says the Arter Grinder Co., Worcester, Mass.

They based that statement on ten years of experience.

Another Example—Byrant Chucking Grinder Co., Springfield, Vt., also found that a welded steel bed for a new internal grinder has high rigidity.

The machine grinds the inner rings of large ball bearing assemblies. (Its welded bed has a swing of 12 in., 3 in. more than the old style.) At the same time, weight was reduced from 1829 to 1788 lb.

Comparative tests on the old and new versions of the grinder were made by running production lots of bearing rings. The new design reduced grinding time from 13 to 8 seconds, lowered size variation from 0.00040 to 0.00015 in., and improved surface finish from 21 to 10 microinches rms.

Effectiveness—"The rules for steel designing are unique. Don't try to copy or duplicate conventional ideas," says Omer Blodgett, design consultant for Lincoln Electric Co., Cleveland.

Vibration problems can be classified into four types: Excessive amplitude, increased amplitude in the critical frequency range, resonance when forced vibrations equal the natural frequency of a member, and inadequate damping capacity in the member.

Generally, there are three methods for meeting those problems:

1. Change the forced frequency, preferably to a lower one. (Change the motor or operating speed.)
2. Change the natural frequency of the member, preferably to a higher one.
3. Increase the damping capacity of the member through redesign.

Steel Weldments—Steel has several good points. Since it has a good modulus of elasticity, it requires a small moment of inertia, and the natural frequency of a weldment remains high. That gives a wide operating range.

Low weights result in low amplitudes of vibration, so there is some limit to the weight reduction that you can realize from steel.

Steel's modulus of elasticity also keeps amplitude of vibration fairly low. That often makes it possible to reduce weight 40 per cent when you design a weldment correctly.

Safety Factor—It is simple to add stiffeners to weldments, reducing the unsupported length of panels or members. A single stiffener which halves the unsupported length increases the natural frequency of the panel four times.

That's an easy way to move natural frequency far away from operating frequency.

Revise Knurling Standard

A revision of *American Standard B5.30—Knurling* has been approved by the American Standards Association and published by the American Society of Mechanical Engineers. The revision includes tool depths for diagonal knurls and various editorial changes for greater clarity.

Copies of the revised standard are available either from the American Standards Association or from the American Society of Mechanical Engineers, New York.

Drive Improves Control

A simple heel-and-toe action on a single pedal controls all forward and reverse lift truck movements with Towmostatic Drive. Smooth, rapid pickup is provided with no jarring. Power application is instant.

Inching and normal braking can be done with the pedal with a little practice, making it unnecessary for the operator to switch his right foot from brake to accelerator and back. His hands are free for steering and lift operations.

Much of the former mechanism required has been eliminated, such as clutch, transmission, drive line, differential, and manual shift lever. That cuts maintenance and downtime costs.

Two constant displacement pumps driven by the gasoline engine provide a flow of hydraulic oil under pressure to two positive displacement piston-type motors. They, in turn, furnish power to each of the drive wheels.

The drive, made by Towmotor Corp., Cleveland, for its trucks, increases grade pull about 20 per cent with rated load.

Operating Time Boosted

Installation of a centralized coolant filtration and pumping system has improved the operating time on five Blanchard grinders by 15 per cent.

The system is used by International Business Machines Corp., in its plant at Endicott, N. Y.

Steel, gray iron, and aluminum chips are washed from the grinders into a floor sump. From here a 400-gpm industrial pump made by Deming Co., Salem, Ohio (originally designed for handling plant sewage) removes the coolant and chips from the sump and discharges them into the filtration system.

The arrangement has operated troublefree for two years. During this time, it has handled about 720 tons of chips.

as MAINTENANCE FREE as CRANES can be...

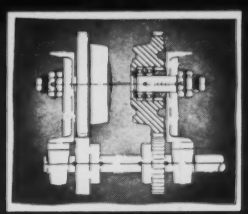
ABELL-HOWE

UNDERHUNG CRANES

now with

FORGED ALLOY STEEL WHEELS, GEARS and PINIONS

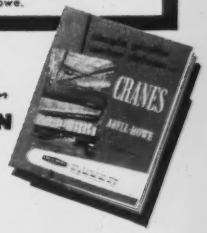
Only Abell-Howe offers you forged steel dependability at all critical points of wear—wheels, gears *and* pinions! Furthermore, Abell-Howe rugged outrigger construction keeps bridge in square—provides lateral bracing for bridge girder. Smooth fluid drive provides cushioned starts whatever the load—reduces reversing shocks. To further assure smooth operation and lasting service, anti-friction bearings used throughout—with double row ball bearings in end truck wheels. Here's crane value that can't be beat!



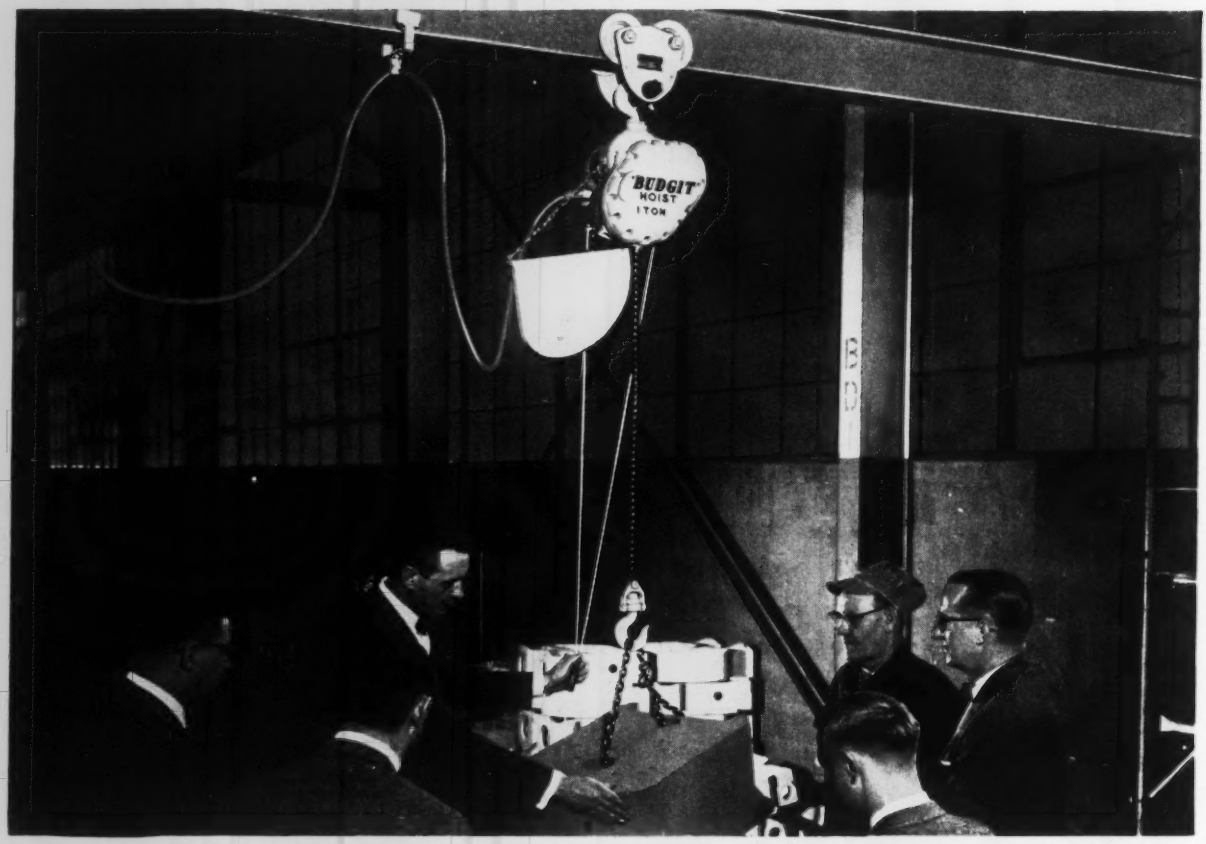
another ABELL-HOWE plus "QUICKLOCK" WHEEL ASSEMBLIES

Combine positive wheel mounting with immediate removability. To remove axle, simply loosen two nuts, twist axle 90° and pull it out. Wheels, too, are as easily removed with no dismantling of truck frame. "QUICKLOCK" is exclusive with Abell-Howe.

Ask for BULLETIN



ABELL-HOWE COMPANY 7757 W. Van Buren St., Forest Park, Illinois



GET A Free Demonstration

LIKE THIS IN YOUR PLANT

Ask us to prove how a 'Budgit' Hoist can cut YOUR lifting costs

Pick up your phone. Call the nearby 'Budgit' Electric Hoist distributor to send a man out with a hoist. (If he isn't listed under 'Budgit' in the hoist section of the yellow pages, write us.) Tell him you've picked a spot to hang the hoist and plug it in. In the few minutes the demonstration takes, you will know how easy, fast and safe lifting can be.

'BUDGIT' IS A MONEY SAVER

Mere pennies pay for all the electricity the 'Budgit' uses a day. It's fast — lifts ¼-ton at 34FPM. One-hand control frees the other hand to guide the load. Each of the two entirely separate automatic brakes alone can hold the load safely. "Quick as a wink" braking saves time in "spotting" loads in machines and for assembly.

No extras to buy. 'Budgit' is a complete lifting tool. Capacities: ⅛ to 2 tons. AC and DC models. 12-volt models operate from truck battery. Priced from $159.

Call your Shaw-Box distributor for a free demonstration today. Or write for Bulletins 15010-14 and 15010-20.

Service stations from coast to coast save time, trouble and money for every 'Budgit' user.

58A-3

MAXWELL MANNING & MOORE INC. M&M TRADE MARK

'Budgit'® ELECTRIC HOISTS

MANNING, MAXWELL & MOORE, INC.

SHAW-BOX CRANE & HOIST DIVISION

384 W. Broadway • Muskegon, Michigan

Builders of "SHAW-BOX" and 'LOAD LIFTER' Cranes, 'BUDGIT' and LOAD LIFTER' Hoists and other lifting specialties. Other Divisions produce 'ASHCROFT' Gauges, 'HANCOCK' Valves, 'CONSOLIDATED' Safety and Relief Valves and 'AMERICAN' and 'AMERICAN-MICROSEN' Industrial Instruments.

In Canada: *Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario*

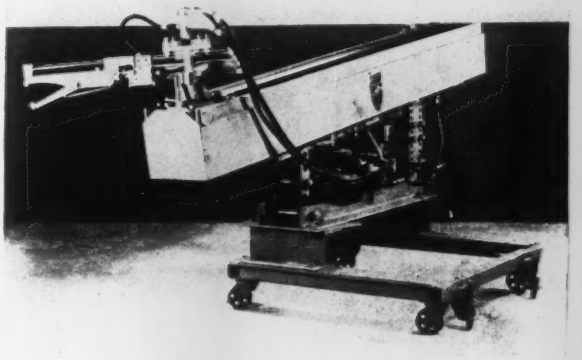
Press Extractor Is Compact and Versatile

A side-arm extractor has been added to Iron Hand automatic press unloading equipment. Features include a self-cleaning angular track, chain drive, and standard components.

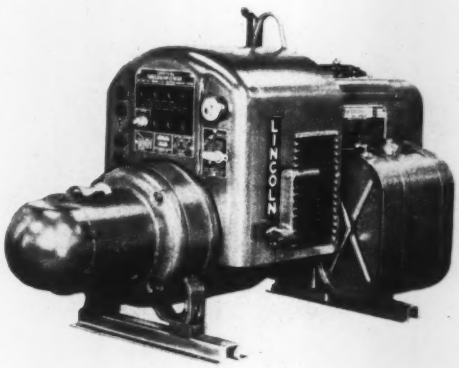
The jaw assembly can be moved so that it operates on the left or right side. Controls are centrally located. It is adjustable for height and angle of extraction.

The extractor is supplied with lubricators, pressure regulators, and all electrical controls.

Where double dies are used in a large press, two units can be mounted—separately or on a common base. Over-all length is 9½ ft; stroke is 8 ft. *Write*: Sahlin Engineering Co. Inc., P. O. Box 289, Birmingham, Mich. *Phone*: Midwest 4-7373



Unit Provides Combination Welding and Power Supply

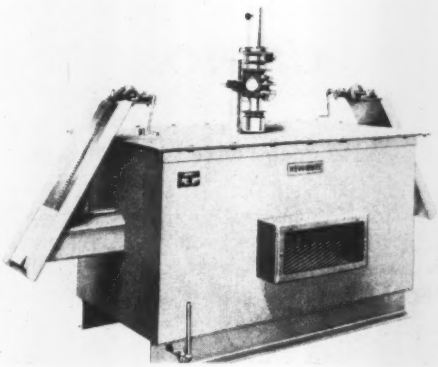


The Weldenpower unit has a 5-kva alternating current power supply and a 200-ampere arcwelder. Separate windings for the welding and power circuits make it possible to weld and supply power at the same time.

The unit provides 115 or 230 volt, 60 cycle, ac single phase power. The four 115-volt receptacles are on the left side of the panel; the 230-volt on the right. Maximum continuous current at 230 volts is 18.2 amperes.

For maintenance welding and hardsurfacing, the unit supplies 20 to 200 amperes. Five taps with a rheostat for intermediate settings provide accurate, continuous current control. Electrodes 5/64 through 3/16 in. are handled. *Write*: Lincoln Electric Co., 22801 St. Clair Ave., Cleveland 17, Ohio. *Phone*: Ivanhoe 1-8100

Furnace Control System Prevents Overloading of Elements



Molybdenum tube furnaces capable of operating at temperatures to 3000° F are available in three standard sizes—single or double end styles.

Its reactor-transformer control system provides a safeguard against overloading the elements and infinite temperature control.

Purge and water-jacketed cooling chambers can be supplied to permit preheat and cooling under a controlled atmosphere. A reducing atmosphere is generally used to protect the elements; however, a second nonporous tube is available to protect the work.

The furnace top is removable for easy access to the elements; explosion relief doors open and close vertically. *Write*: Hevi-Duty Electric Co., Milwaukee 1, Wis. *Phone*: West 3-2756

(*Please turn to Page* 276)

EVERYTHING YOU NEED IN CHROMIUM

Here's one case where *getting* all your eggs from one basket pays off! When you meet *all* your chromium alloy requirements from the complete Vancoram line, you keep inventory and ordering problems to a minimum . . . you are *assured* of constant, superior quality . . . and you can count on expert technical advice, no matter what problem crops up in your melt shop.

And here's another plus! Because VCA is fully integrated from mine to finished product, and supplies *every* major chromium alloy, you can count on unbiased recommendations when you need them. What's more, intensive, continuing Vanadium Corporation

ALLOYS—FROM A SINGLE SOURCE!

metallurgical research means new, better alloys will come your way. So, whenever it's a question of chromium alloys, always get the best answer—from your VCA representative!

We'll be at the METAL SHOW, Booth No. 446, Cleveland, Ohio, October 27-31. See you there!

VANCORAM

VANADIUM CORPORATION OF AMERICA

420 Lexington Ave., New York 17, N. Y.
Chicago • Cleveland • Detroit • Pittsburgh
Producers of alloys, metals and chemicals

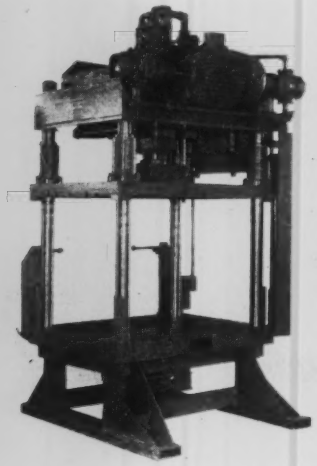
NEW PRODUCTS and equipment

Press Has High Speed

This 35 ton, fast acting, air hydraulic, trim press is designed for trimming diecastings, swaging, stamping, blanking, forming, drawing, shearing, and other special applications.

It has a 48 x 40 in. free working area inside of the 4 in. tiebars, and a 30-in. stroke. Its approach speed is 1400 ipm; pressing speed, 140 ipm; return speed, 700 ipm.

The unit is air-hydraulically actu-



ated. Air is forced behind the piston ram under an accumulator system to obtain the high speed. *Write*: B & T Machinery Co., Holland, Mich. *Phone*: Export 2-2343

Unit Tests Rapidly

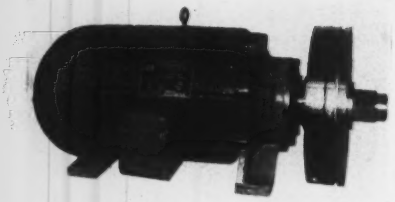
The Gries-Wazau elastic loop dynamometers provide rapid and convenient checking of tensile and compressive loads.

Their precise optical reading arrangements utilize Carl Zeiss spiral measuring microscopes. Direct readings of elastic deformations as close as 0.0001 mm (1/10 micron) are obtained.

The precision and sensitivity of readings by different operators are extremely high. *Write*: Gries Industries Inc., New Rochelle, N. Y.

Saw Spindle Motorized

This motorized friction saw spindle of the heavy duty steel



mill type is available in 40, 50, 60, and 75 hp ratings.

Elimination of belts, pulleys, individual motors, motor mounts, and guards has resulted in low initial cost, maintenance savings, and compactness.

The arbor handles friction saw blades from 46 to 56 in. in diameter. *Write*: Enterprise Co., Columbiana, Ohio.

Film Protects Metal

This weatherproofing film is applied by spraying, brushing, or dipping. It can be used on any nonporous material, machinery, tools, dies, and metal stock.

The dry film is nonflammable, and the protected object can be restored without cleaning or preparation. The film is simply peeled off.

There is no oily residue or any type of contamination. *Write*: Harco Chemical Co., Cranford, N. J. *Phone*: Bridge 6-1096

Motor Is Powerful

A powerful, continuous duty servomotor, Type 23-5251-01, meets SAE precision control motor requirements according to ARP 497.

It provides essential requirements of MIL-S-17087 and environmental

requirements of MIL-E-5272A. No load speed is 5000 rpm; stall torque is 6.5 oz-in. Bearings and housing are stainless steel. *Write*: Avionic Div., John Oster Mfg. Co., 1 Main St., Racine, Wis. *Phone*: Melrose 3-6331

Nonferrous Metals Tested

This multifrequency equipment permits high speed, nondestructive inspection of nonferrous and nonmagnetic metals. It uses the eddy current system.

Production line or independent

testing can be done on tubing, bars, and wire to reveal surface and subsurface defects, grade (chemical properties), dimensions, and physical and metallurgical properties.

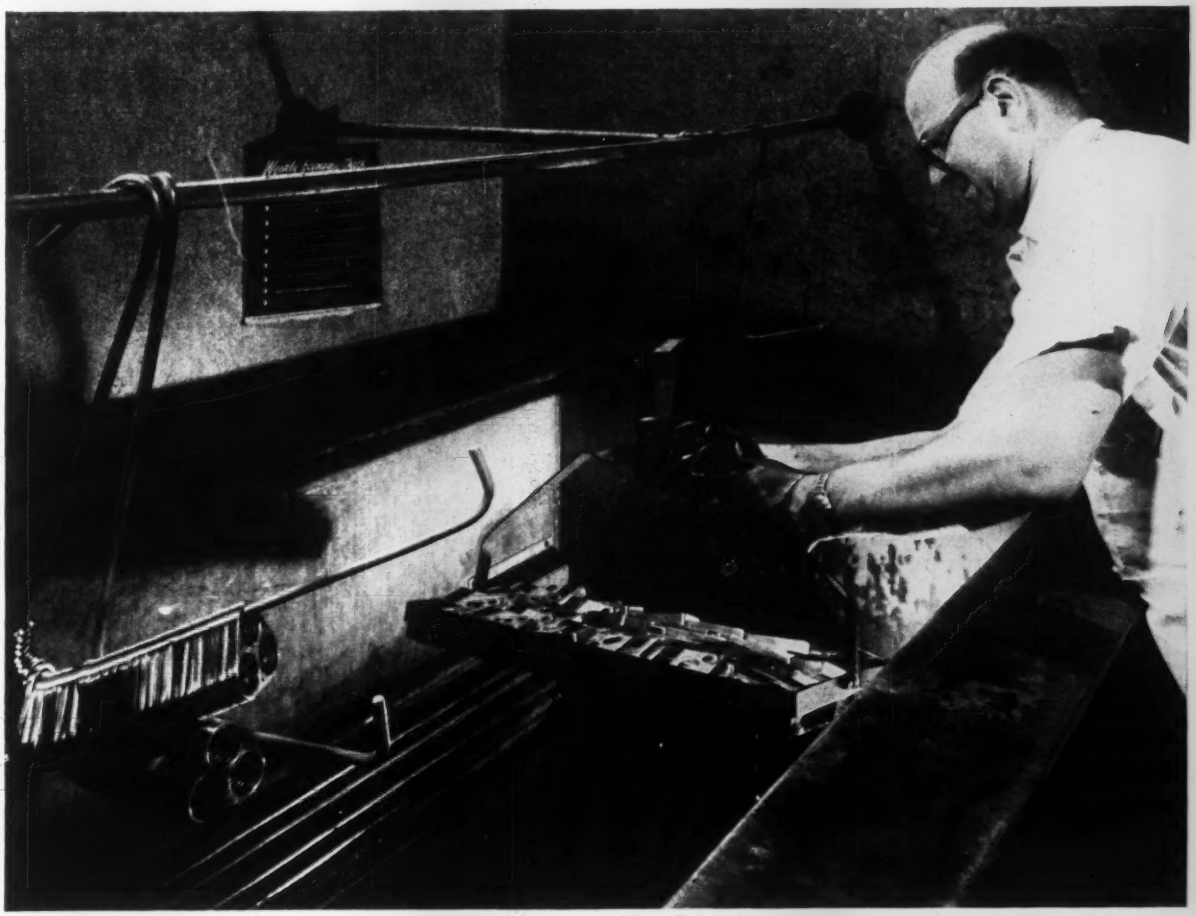
Inspection speeds range from 200 to 600 fpm. Coils are available for testing material from 1/8 to 3 in. OD. *Write*: Magnetic Analysis Corp., 42-44 Twelfth St., Long Island City 1, N. Y. *Phone*: Stillwell 4-7628

Unit Provides R-F Power

The Model IH-25 generator has a minimum output rating of 25 kw (NEMA standards) at a nominal frequency of 450 kilocycles. It supplies power for induction hardening, drawing, melting, and brazing.

The unit uses six wide-swing saturable reactors to achieve fine heat control adjustment throughout the entire operating range. A built-in air-to-water heat exchanger allows safe operation under most adverse operating conditions.

The generator meets all requirements of the Federal Communications Commission. *Write*: Welduc-



When Bell & Howell switched to Nialk Trichlorethylene with **psp**—permanent staying power, it extended clean-outs to a full three months.

How Bell & Howell degreases 390,000 lbs. of metal parts between bath clean-outs

When Bell & Howell switched to a Nialk® Trichlorethylene bath recently, it was found that bath clean-outs could be extended to a full three months.

Previously the bath had to be cleaned *every ten days.*

With the new Nialk bath, Bell & Howell is degreasing 195 tons of small camera and projector parts between clean-outs. The parts are aluminum, brass, steel and zinc and can all be cleaned in the same bath.

The secret is in the stabilizer

The only thing different about the Bell & Howell bath is the Nialk stabilizer. Light, heat, air and acids have no effect on the bath. Even aluminum fines, which can sour trichlor fast, have no effect in the presence of the Nialk stabilizer.

This stabilizer is not extracted by water either; hence all of it is reclaimed during distillation and steam injection. So permanent is the stabilizer that the bath stays fresh and fully protected at all times.

Bell & Howell simply adds more trichlor as drag-out losses lower the bath level; they never have to replenish the stabilizer itself.

FREE BULLETIN • The whole question of stabilizers is so important to anyone concerned with vapor degreasing, we've written a bulletin specifically on the Nialk stabilizer and its advantages. Write for Bulletin 70 if you'd like a copy.

HOOKER CHEMICAL CORPORATION
1211 Union Street, Niagara Falls, N. Y.

HOOKER CHEMICALS PLASTICS

NIALK® CHEMICALS
OLDBURY® CHEMICALS
SHEA® CHEMICALS
DUREZ® PLASTICS

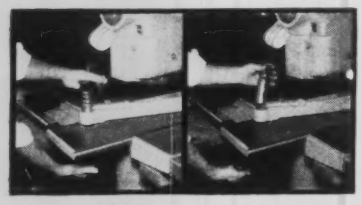
Sales Offices: Chicago, Ill.; Los Angeles, Calif.; New York, N. Y.; Niagara Falls, N. Y.; Philadelphia, Pa.; Tacoma, Wash.; Worcester, Mass. *In Canada:* Hooker Chemicals Limited, North Vancouver, B. C.

THE STRIPPIT FABRICATOR — a single compact multi-purpose Punch Press with quick-change tool holder, quick-set gauging and stops.

Short run? Complicated pattern? If it's sheet metal up to ¼" mild steel, if it's punching, notching or nibbling, it's profitable on a Strippit Fabricator!

Set up in minutes! Punches and dies are changed in 30 seconds or less, and Strippit guided punches need no aligning or adjusting. Back stop with precision gauge is instantly set by a locking knob. Self-tripping finger stops on gauge bars provide multiple stopping as the work is moved rapidly under the punch. A switch gives you single punching or 165-stroke-a-minute nibbling, and all tools are within quick reach in attached "file drawers" or shelves. The Fabricator is more than a one-machine shop — it's a whole system of quick-change, high-profit fabrication used by thousands of shops.

What's more, you can add the Strippit Positive Duplicator for high-speed punching in medium runs — plus the Dupl-O-Scope to punch Duplicator templates right from the drawing, in a few minutes. Write today for details and demonstration at your plant by the Strippit mobile unit. Warehouse stocks in Chicago and Los Angeles.



TOOL HOLDER is pulled out, for instant removal of die and punch assembly, ready for the next interchangeable tool. 1¼" diameter capacity holder shown, 3½" diameter holder also available.

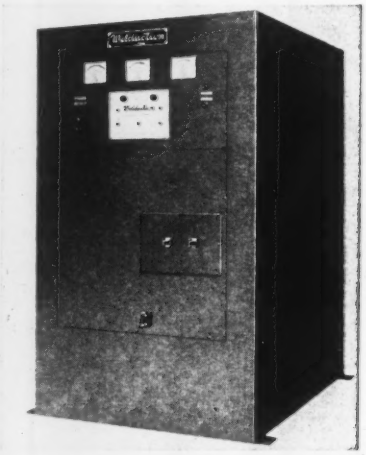
UNIT OF HOUDAILLE INDUSTRIES, INC.

WALES STRIPPIT COMPANY

210 Buell Road, Akron, New York

In Canada: Strippit Tool & Machine Limited, Brampton, Ontario

NEW PRODUCTS and equipment



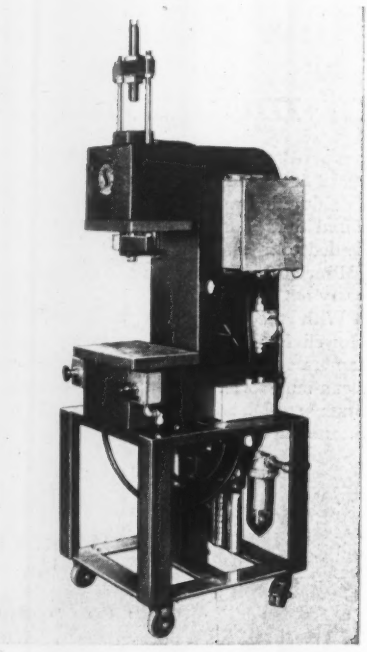
tion Corp., 10230 Capital Ave., Detroit 37, Mich. *Phone*: Jordan 4-6768

Press Stop Is Positive

Air-hydraulic, high speed production presses give positive ram speed and stop control with no overtravel.

They are equipped with two-hand safety controls. Ram pressure is adjustable from 2 to 12 tons with identical speed cycle. Ram cycle speed of 2000 minimum an hour is possible with 6 in. down and return.

No cooling water is required re-



HERESITE

REG. U. S. PAT. OFFICE

COATED IRON PIPES AND FITTINGS PROTECT YOUR PRODUCTS

Many industries rely on HERESITE PURE PHENOL-FORMALDEHYDE resin lining in steel pipes and steel pipe fittings to control corrosion and commodity contamination.

Since 1942 the oil industry has used millions of feet of pipe which were lined with HERESITE to reduce corrosion fatigue.

Catalog No. 57 will be mailed if requested on your letterhead.

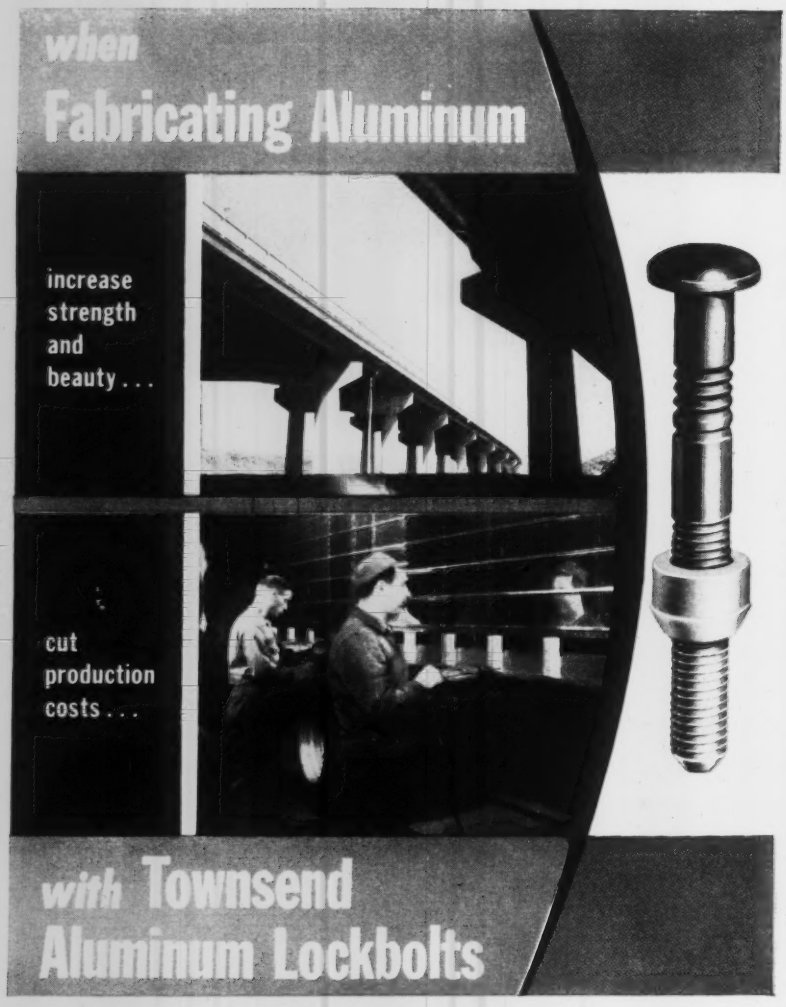
HERESITE & CHEMICAL COMPANY

MAIN OFFICE & PLANT—MANITOWOC, WISCONSIN

EASTERN DIVISION—GARWOOD, NEW JERSEY

Canada: Dominion Rubber Company, Ltd.
Montreal, Quebec

Europe: Aluminium-Schweisswerk A. G.
Schlieren-Zurich, Switzerland



Appearance is improved, since the aluminum lockbolts* match the material being fastened. Joints are neat—there is no roughness or weld-splatter, no tool marks, no rust streaks after exposure to weather.

Lockbolts will not alter the mechanical values of the material being fastened, and their high tensile pre-load values are uniform. These two factors make design calculations simpler and more accurate.

Townsend aluminum lockbolts can lower your production costs, because operators with no special skill or training can make strong, uniform joints at high production rates. The setting guns are designed to eliminate the possibility of human error.

If you are fastening aluminum, investigate the advantages of Townsend lockbolts. Write for Bulletin TL-101. Townsend Company, P. O. Box 237-C, New Brighton, Pa.

*Licensed under Huck patents RE22,792; 2,114,493; 2,527,307; 2,531,048; 2,531,049 and 2,754,703

The Fastening Authority

Townsend

COMPANY • ESTABLISHED 1816

NEW BRIGHTON, PENNSYLVANIA

Sales Offices in Principal Cities

Cherry Rivet Division • Santa Ana, California

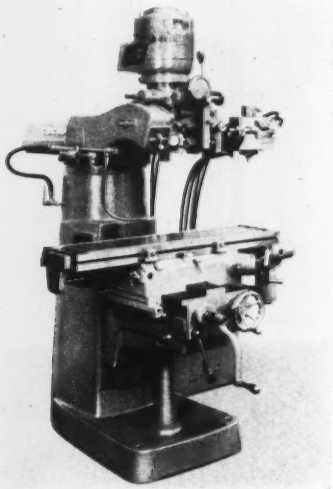
NEW PRODUCTS and equipment

gardless of cycle speed. Presses are available in 2½, 5, and 10 ton capacities. *Write*: Studebaker Hydraulic Products Co., 1733 N. 33rd Ave., Melrose Park, Ill. *Phone*: Fillmore 4-0065

Miller Has 3-D Control

The 1C Contourmaster milling machine is equipped for three-dimensional, hand guided, hydraulic tracer controlled milling.

The 3-D unit controls the direction of table and saddle traverse for 360-degree horizontal profiling, and



the vertical movement of the spindle quill for vertical profiling. Deflection of the stylus results in a corresponding movement of the table, saddle, and spindle quill—separately or in unison.

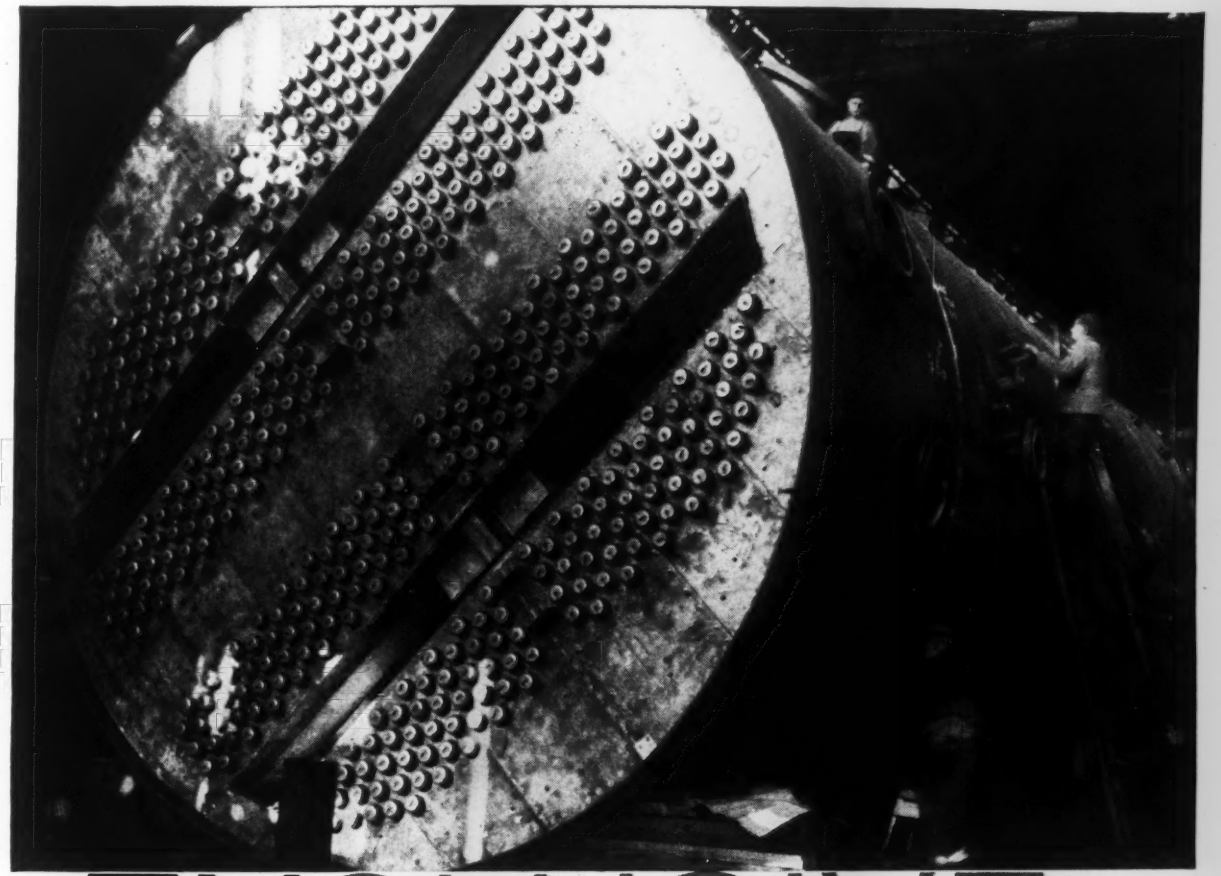
In one setting, the full 22-in. table travel and 10-in. cross travel can be used for 360-degree, hand guided, profile milling cuts. *Write*: Cincinnati Milling Machine Co., Cincinnati 9, Ohio. *Phone*: Redwood 1-2121

Feeder Uses Small Space

These heavy duty electromagnetic vibratory feeders are designed for high capacity feeding where installation space is limited.

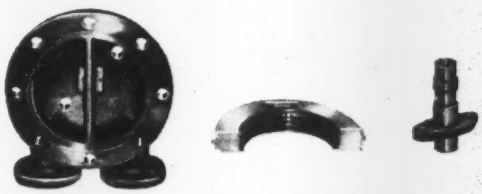
They combine two standard electromagnet drive units to provide power to convey material at fast feeding rates.

A wide range of models offers



EXCLUSIVE...

At Sun Ship, STAINLESS STEEL is synonymous with EXCLUSIVE, because Stainless is never exposed to contamination by fabrication with ordinary carbon steel tools.

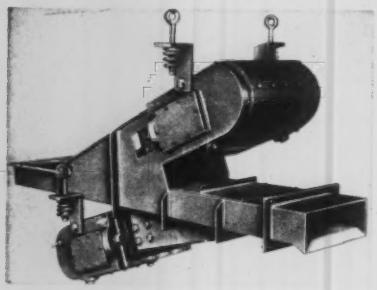


Working with the 300 to 400 series of alloys, clad steel, aluminum and other alloys, Sun fabricates pressure vessels, tanks, towers, troughs, autoclaves, reactors, hoppers, platework and machinery in all sizes and types. Each to exact specifications. Each with an additional quality feature... EXCLUSIVE.

SUN SHIP

BUILDING & DRY DOCK CO.
CHESTER, PENNSYLVANIA

NEW PRODUCTS and equipment



maximum feeding capacities from 25 to more than 1000 tons an hour in dry materials weighing about 100 lb per cu ft. *Write*: Syntron Co., 370 Lexington Ave., Homer City, Pa. *Phone*: 9-8011

Cleans, Phosphates Iron

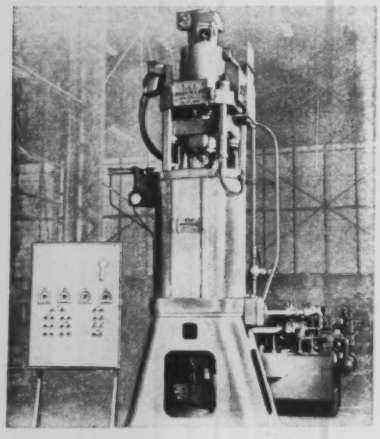
Turcoat 4185 simultaneously cleans and coats iron, steel, or zinc with light phosphates in three simple stages. It assures paint adhesion and prevents rapid rerusting of steel prior to painting.

This material meets the salt spray and paint adhesion requirements of USA-57-0-2C, Type II, Class C. Products can be sprayed or dipped. *Write*: Turco Products Inc., 6135 S. Central Ave., Los Angeles 1, Calif.

Two Powders Compacted

This automatic hydraulic powder compacting press is capable of handling two different materials in the same operation.

Two independent, shuttle-type feed shoes and hoppers enable bimaterial compacting (such as combined iron-ceramic brake linings or bimetal electrical contacts). Production speeds range up to 15 a minute.

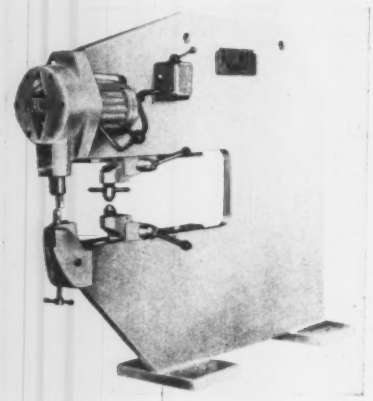


Models are built in 50, 100, 200, 300, and 500 ton capacities. *Write*: Kux Machine Co., 6725 N. Ridge, Chicago 16, Ill. *Phone*: Ambassador 2-3070

Machine Shears 13 Gage

This smaller version of the Pullmax shearing and forming machines is for work with material that is 13 gage or lighter.

The P-1 does straight, circular, inside, irregular, slot, and louver cutting, as well as beading, joggling, flanging, edge bending, and dishing. *Write*: American Pullmax Co., Sheffield and Altgeld Streets, Chicago 14, Ill. *Phone*: Diversey 8-5727



Large Packages Strapped

The E41 power strap feed unit puts strapping around a package at the rate of 5 fpm. The operator no longer has to walk around the package, nor does he need an assistant.

It will handle steel strap from $\frac{3}{8}$ x 0.010 in. to $\frac{3}{4}$ x 0.023 in., and will feed around any package up to 56 in. high and 48 in. wide. *Write*: Acme Steel Co., 135th Street and Perry Avenue, Chicago 27, Ill. *Phone*: Interocean 8-9500

Wheel Balances Itself

An expanding wheel for circular abrasive belts is self-balancing and maintains a flat edge, so that it can be used for polishing and tool grinding.

The wheel's floating action frees

How to measure

Now is the time to take a long, hard look

A continuous furnace is more than just a brick-lined structure built to heat a material; it is a processing tool.

Like all processing tools, it must be evaluated on an overall basis. Fuel consumption and efficiency may be completely outweighed by many more-important economic factors centering around your workpiece, your total production program, and your work force.

Your evaluation may well prove that an investment now in Selas continuous heat processing will bring immediate returns in reduced costs and improved product quality.

To help you take this long, hard look at your heat processing equipment or requirements, Selas offers these 15 evaluation factors:

- **Work in process**
- **Material handling**
- **Product value**
- **Product quality**
- **Production requirements**
- **Process coordination**
- **Automatic operation**
- **Temperature control**
- **Labor requirements**
- **Fuel efficiency**
- **Maintenance**
- **Equipment flexibility**
- **Material saving**
- **Human element**
- **Floor space**

The factual report on the facing page tells how the Heppenstall Company took this long, hard look at its heat treating operations. All evaluation factors proved important: several represented significant savings!

See Selas Heating in Action at the Metal Show Booth 1924

the real cost of automatic heat processing

. . . here's how one SELAS installation stands up under that "long, hard look!"

High speed heating furnaces, designed to meet the demands of high speed production, have become an improved processing tool for the steel industry.

Heating die blocks for hardening is no longer a 20-30 hour operation at this steel mill.

A completely automatic program-control heating method designed and built by Selas increases heating rates 5 times, reduces the cycle to 3-4 hours for work loads up to 20 tons.

The installation is the outgrowth of a search for a heating method that would enable the Heppenstall Company to keep pace with increasing production requirements without undergoing costly plant expansion.

The entire furnace was prefabricated at Selas and, within one week of delivery, production tests were under way.

Work in Process

The one Selas furnace handles as much tonnage as 5 conventional furnaces of same size. For a given rate of output, work in process in Selas furnace is $\frac{1}{5}$ that required by conventional heating.

Material Handling

The ability to process increased tonnage in shorter time in one furnace contributes to more efficient use of handling equipment.

Product Value

Value of material processed in only six turns exceeds the cost of the furnace!

Product Quality

This furnace successfully treats large sections of hard-to-harden steels. A typical analysis is 0.50 carbon, 0.70 manganese, 0.04 phosphorus, 0.04 sulphur, 0.25 silicon, 0.85 chromium, 0.04 molybdenum and 0.06 vanadium.

Production Requirements

The Selas furnace meets increasing production demands for die block hardening without expanding plant facilities. This fast heating furnace has become primary source of die block heating with twelve other conventional furnaces being used to supplement production needs.

Process Coordination

The Selas furnace makes possible close adherence to a tight production schedule resulting in overall plant efficiency. Manpower, crane and quench facilities are effectively utilized.

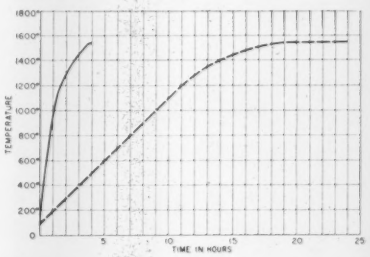
Automatic Operation

Fast response of this Gradiation® furnace permits accurate automatic control of die block temperature. Cams set temperature cycle to meet heat requirements in terms of thickness of die blocks.

24,000 pounds of fast-heated die blocks leave Selas car-bottom furnace. Fast heating furnace outproduces 5 conventional furnaces of same size; eliminated need for new heat treat building.

Temperature Control

Heating is completely automatic, the temperature being regulated by preset program-control. Uniform heating by radiant gas fired Duradiant® burners permits drastic reduction of heating cycle. Curves compare heating rates for center of die



block in Selas furnace (solid line) with conventional long heating cycle (dashed line). Temperature readings in °F.

Labor Requirements

Process requires minimum attention. About 20 min of an operator's time is all that is needed over an entire heating cycle.

Fuel Efficiency

Total fuel cost, something under $2.00 per ton, is actually $\frac{1}{60}$ of the product value of a single furnace charge. Furnace uses 20% less fuel per ton of steel heated than conventional furnaces.

Maintenance

Practically none in 4 years.

Equipment Flexibility

Blocks processed in this furnace range from 8 in. to 24 in. thick. Designed for 20-ton charge, furnace has processed charges weighing from 6 to 28 tons.

Material Saving

High yield is maintained on a continuing basis; scale formation is negligible.

Human Element

Automatic control of the heating cycle eliminates variations due to human handling and operation.

Floor Space

In the space previously occupied by one conventional furnace, this Selas fast heating furnace now accomplishes the work of 5 conventional furnaces! Eliminated need for new heat treat building.

* * *

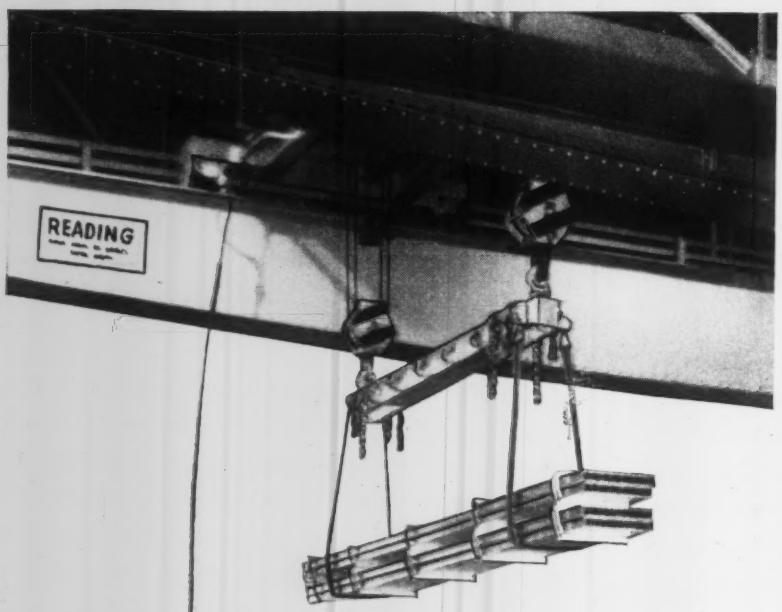
For case histories covering steel mill heat processing operations, as well as heat treating, heating for hot working and brazing, send for reprint "An Economic Appraisal of Continuous Heat Processing" and "Fast Heating Is Practical . . . and Safe." Address Dept. 210, Selas Corporation of America, Dresher, Pa.

Gradiation and Duradiant are registered trade names of Selas Corporation of America.

SELAS CORPORATION OF AMERICA DRESHER, PENNSYLVANIA

Heat and Fluid Processing Engineers

DEVELOPMENT • DESIGN • CONSTRUCTION



At ALCOA, 2 Reading Cranes do the **heavy** work . . .

Two 10-ton Cranes by Reading are now in operation at ALCOA's Lafayette, Indiana plant. One is used for heavy handling in the area around the 14,000-ton extrusion press, while the other has made an important contribution to easier, more economical warehousing.

The warehouse area crane, pictured above, operates from the floor by a pendant push-button station. Both crane slings and steel-handling racks are used. It's a spread bridge model and runs on a 220′ track.

Since its installation, warehousemen are able to stack higher, handle longer and heavier aluminum shapes, tubing and ingots. More space is made available for storage and both time and labor are saved.

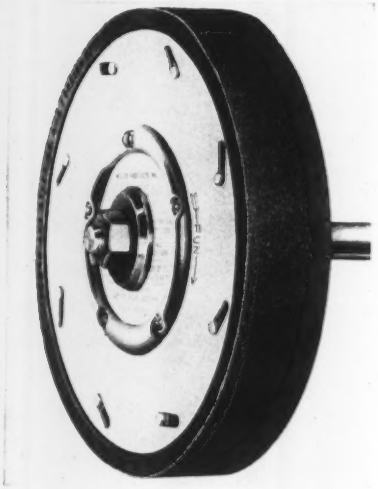
Reading's unique "Unit Construction" plan offers you special equipment for your own plant at the low cost of standard parts. Investigate now this proven way to get faster, better materials handling. A note on your company letterhead will bring a Reading engineer to analyze your handling operations . . . at no obligation.

READING CRANE & HOIST CORPORATION, 2102 Adams St., Reading, Pa.

READING CRANES

CHAIN HOISTS | OVERHEAD TRAVELING CRANES | ELECTRIC HOISTS

NEW PRODUCTS and equipment



it from edge distortion caused by centrifugal force and allows it to achieve dynamic balance.

Its neoprene wheel was developed and molded by Ohio Rubber Co. Two versions are available—one for 1250 to 2250 rpm and the other for 3450 rpm. *Write:* Miller Products Co., Box 325, 1438 12th St., North Chicago, Ill.

Compounds Finish Metal

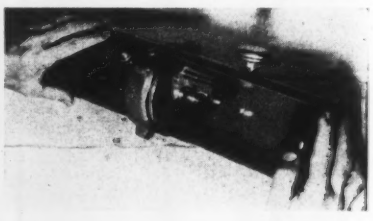
Five Supersheen barrel finishing compounds have been introduced. They cover these processing needs: Brightening, No. 407; fine grinding, No. 408; deburring, No. 410; burnishing, No. 412; and inhibiting rust, No. 501R. *Write:* Almco Div., Queen Products Inc., Albert Lea, Minn. *Phone:* 3966

Power Unit Self-Contained

These self-contained power packages produce hydraulic power from an electric source.

They incorporate an electric motor, hydraulic gear pump with integral relief valve, check valve, and reservoir in one compact assembly.

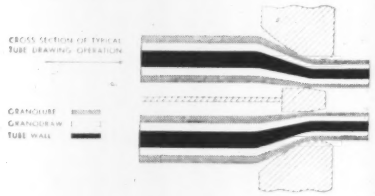
Pressure loaded bearings auto-



CHEMICAL CONVERSION COATINGS and their functions in facilitating the cold mechanical deformation of metals

By ARTHUR DAHL, Product Development Dept., AMCHEM PRODUCTS, INC.

When used to facilitate the cold mechanical deformation of metals (in drawing, extrusion, stamping, cold heading, necking, and upsetting operations) chemical conversion coatings in conjunction with suitable lubricants perform three important functions. One, they prevent metal-to-metal contact between work and tool. Two, they prevent galling and seizing. Three, they protect stock indefinitely, permitting the storage of in-process work at any stage of production, without danger of corrosion damage.



Characteristic of the tightly bound, highly absorptive, crystalline coating formed by the processes is the ability of the coating to retain lubricity throughout forming operations when treated with a suitable lubricant. This offers the following production advantages:

- **Higher degree of reduction**
- **Greater speed of draw**
- **Longer tool life**
- **Fewer process anneals and pickling**
- **Finer surface finish**
- **Cleaner mills**
- **Easier inspection of finished product**

Also of interest to production men is the exact duplication of coatings from batch to batch. And the processes are much simpler than other methods of coating metals—baths can be set up and running in less time than it takes to determine suitable coatings by other methods.

TYPES OF COATINGS AND THE METALS FOR WHICH THEY ARE DESIGNED

Zinc phosphate coatings for carbon steel. These coatings can be applied by either dip or spray systems.

Dip. ACP Granodraw No. 1 is typical of the dip process. The sequence includes precleaning, water rinse, pickling, water rinse, water rinse, Granodraw No. 1 solution, water rinse, and a hot neutralizing rinse. Surfaces to be treated must be free of oil, grease, rust and scale. The above sequence insures that they will be. And when metal is free of rust and scale, the pickling bath and two succeeding water rinses can be omitted. In either case, a lubricant like ACP Granolube or conventional lubricant must be applied prior to working the metal.

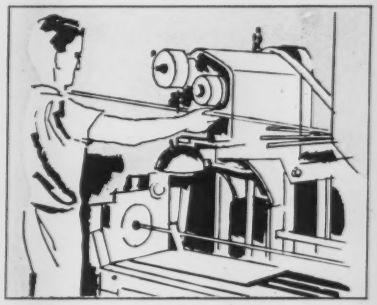
Spray. ACP Granodraw No. 4 is an example of the spray process. It usually requires 5-stage equipment and includes the following steps: precleaning, water rinse, Granodraw No. 4 solution, water rinse, lubricant. After chemical treatment, the work must be dried before forming.

Oxalate Coatings for the stainless steels and many of the high nickel alloys. These coatings are applied only by immersion process, and usually in a 5-stage system which includes an acid pickling or depassivating bath, a water rinse, the ACP Granodraw SS coating bath, a hot borax neutralizing rinse for wire stock, or a lubricating bath for tube stock. Since thorough activation of the metal surface is necessary to promote an adherent coating, the pickling and activating bath is an important stage in processing.

Fluoride-type coatings for zirconium and its alloys. Granodraw ZR is such a coating. It is applied in an immersion process which includes precleaning, water rinse, pickling, water rinse, Granodraw ZR solution, water rinse, drying or lubricating. It has been used primarily in the treatment of stock prior to wire drawing and tube drawing. Surfaces are cleaned of oil and grease by solvent degreasing or alkali cleaning. Pickling is required to provide a surface that is chemically and metallurgically receptive to the coating.

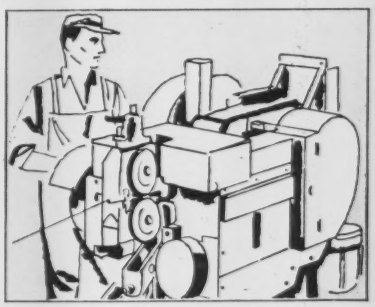
Strong alkali coatings for tantalum and amorphous phosphate coatings for aluminum. These two types of coatings are now in the development stage. Laboratory and field tests are being conducted, results are being evaluated, and modifications in chemical makeup and process sequence are being made to meet requirements. Several field tests, however, have indicated that they will do the same job for tantalum and aluminum processors as the other types of coatings have done for those working carbon steel, stainless steel, high-nickel alloy, and zirconium.

For more information write us at Ambler.

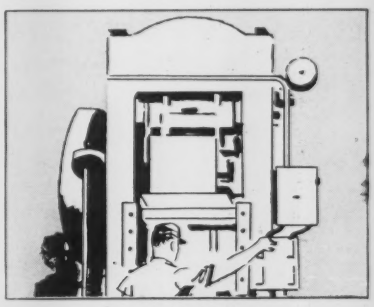


Tube Drawing

Wire Drawing



Cold Heading



Impact Extrusion

Note. Granodraw and Granolube are registered trademarks of Amchem Products, Inc.

Amchem Products, Inc. Ambler 19, Pa.

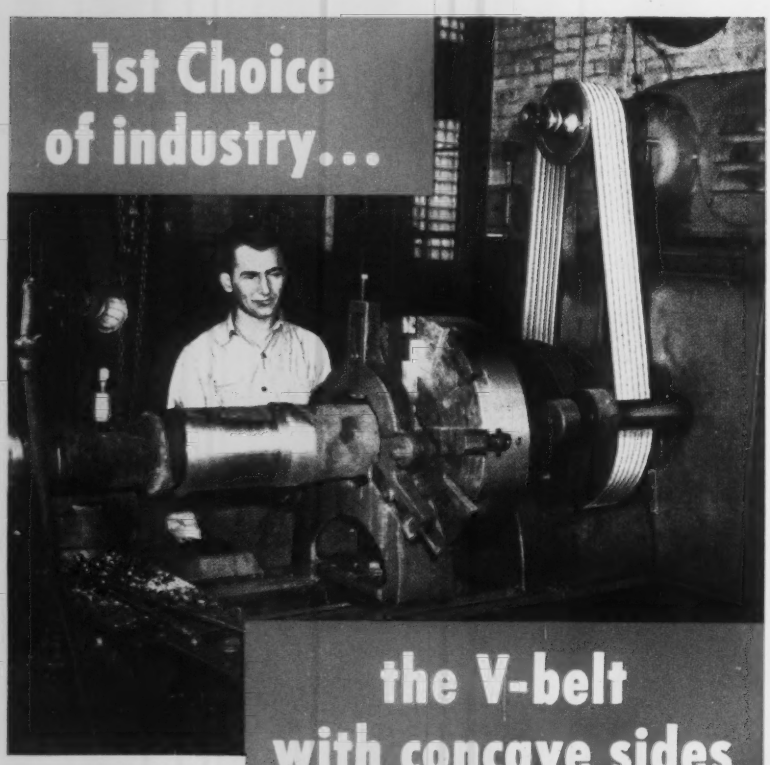
Formerly AMERICAN CHEMICAL PAINT COMPANY

CHEMICALS ACP PROCESSES

DETROIT, MICH. • ST. JOSEPH, MO.
NILES, CALIF. • WINDSOR, ONT.

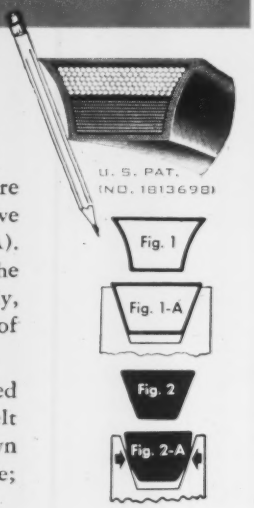
New Chemical Horizons for Industry and Agriculture

1st Choice of industry...



the V-belt with concave sides

Here's why:
The Concave Sides of Gates V-Belt *insure* longer life... lower costs



Try this. Bend a Gates V-Belt as if it were going around a sheave. Feel how the concave sides (Fig. 1) *fill out*... become straight (Fig. 1A). This precise fit insures full contact with the sides of the sheave... grips the sheave evenly, distributing wear uniformly across the sides of the belt. Uniform wear lengthens belt life.

Make the same test with a straight-sided belt (Fig. 2). Feel how the sides of the bent belt *bulge out*, concentrating wear at points shown in Fig. 2A. Uneven wear shortens belt life; increases costs.

Because Gates V-Belts with Concave Sides are so universally preferred, they are also the *most widely available*. Gates V-Belts are carried by leading distributors in industrial centers throughout the world.

The Gates Rubber Company, Denver, Colorado

Gates *World's Largest Maker of V-Belts* TPA 342

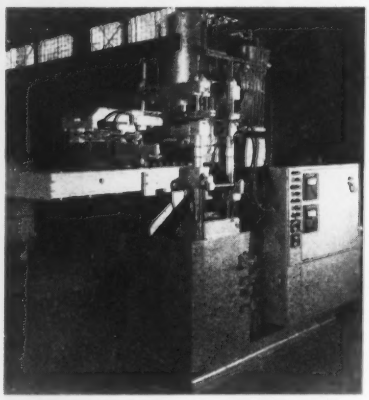
Gates VULCO ROPE Drives

matically compensate for wear to assure high volumetric efficiency and longer life. A wide variety of heavy work loads is handled (such as found in lift trucks, tailgate loaders, and tractors). *Write*: Wooster Div., Borg-Warner Corp., Wooster, Ohio. *Phone*: Howard 2-2010

Press Molds Closures

An automatic closure molding press of 50-ton capacity is equipped with an automatic unscrewing device which permits the molding of decorative reverse-taper closures as well as straight-wall designs.

The Model 742 press supersedes the Model 252, but all molds for the



earlier one can be used without modification.

The machine can mold caps of any size, shape, or form with internal or external threads, in large quantities, at low cost. *Write*: F. J. Stokes Corp., 5500 Tabor Rd., Philadelphia 20, Pa. *Phone*: Cumberland 9-0100

Container Detachable

Detachable containers, up to and over 40 cu yd capacity, are used in the Dempster-Dinosaur system of material handling.

Advantages include large capacity containers, better weight distribution, legal load limits up to 30,000 lb, and unlimited off-the-road capacities.

It has complete hydraulic operation without use of winches, sheaves, telescopic cylinders, cables, or chains. All pickup and handling

FORGED Parts Help You Sell

—especially when competition gets keen

EDWARD I. DANSEREAU
District Manager,
Huntington, W. Va. District Office
Joy Manufacturing Company
leading maker of mining machinery

"When I talk about the quality materials that go into Joy equipment I often point out the many forged parts we use as proof of performance superiority. Mine operators need and insist on rugged and reliable equipment. The recognized strength and stamina in service of forged parts really helps us in convincing customers of the built-in quality of our machines. Forged parts certainly do help you sell—especially when competition gets keen."

POSTSCRIPT: THE PRODUCTS OF THE FORGING INDUSTRY ARE FOUND AT VITAL POINTS OF MODERN CONVEYANCES AND MACHINES...LEVERS, STRUTS, CRANKSHAFTS, GEARS. THE FORGING PROCESS IS UNLIKE ANY OTHER. *FORGED* PARTS START WITH REFINED METALS—METALS ALREADY TRIED AND PROVED. THESE METALS ARE GIVEN ALMOST ANY DESIRED FORM OR SHAPE BETWEEN IMPRESSION DIES, UNDER ENORMOUS PRESSURE OR BY CONSECUTIVE BLOWS FROM POWERFUL HAMMERS. THE RESULT IS ADDED STRENGTH AND TOUGHNESS...WHICH PERMITS WEIGHT-SAVING DESIGNS, CUTS SERVICE COSTS, HELPS PROVIDE SAFETY IN A HIGH-SPEED WORLD.

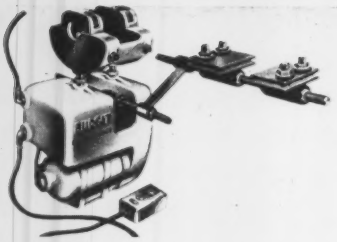
DROP FORGING ASSOCIATION • 55 Public Square • Cleveland 13, Ohio

COMPOSED OF THE INDEPENDENT COMPANIES PRODUCING THE MAJOR SHARE OF COMMERCIAL FORGINGS IN THE UNITED STATES & CANADA

operations are performed without the driver leaving the truck cab, and it can place containers on and off docks. *Write*: Dept. DS-74, Dempster Bros. Inc., Knoxville, Tenn. *Phone*: 4-1671

Drive Cushions Start

Cushion-start models are now included in the Budgit bridge drive units. They are used for converting manually operated crane bridges to electric drive.

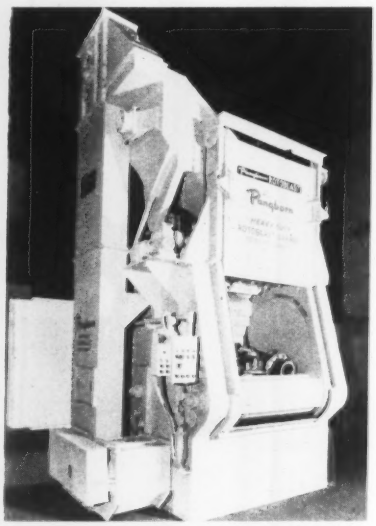


The system provides smooth, even acceleration and braking to keep load swing or drift to a minimum. This is done by a motor brake that spreads the time lapse from start to full bridge speed (or from full speed to stop) to a maximum of 3½ seconds. The time lapses can be varied. *Write*: Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore Inc., Muskegon, Mich. *Phone*: 3-1311

Cleaner Ups Production

The Type 20 GN heavy duty, 20 cu ft Rotoblast barrel has an extra heavy work conveyor which allows loads up to 3500 lb. Single pieces can weigh up to 800 lb.

During operation, an effective abrasive cleaning and reclaiming



system removes all sand and debris, maintaining full efficiency of the abrasive.

A 30-hp motor allows the wheel to throw 50,000 lb of abrasive an hour for rapid blast cleaning. *Write*: Pangborn Corp., Hagerstown, Md. *Phone*: Hagerstown 3500

Small Unit Mills 3-D

A small contour milling machine, called the Hydroversion, is equipped with a True-Trace 3-D valve for either 360-degree or three-dimensional milling.

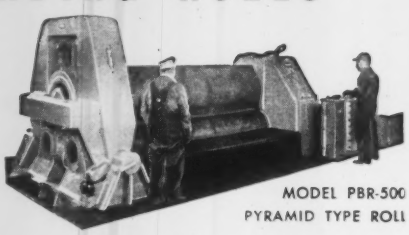
The 28 x 64 in. table has 36 in. of travel. Two 5-hp electric spindles are mounted on 12-in. centers. Spindle speeds range from 87 to 2600 rpm.

The hydraulic power unit is in-

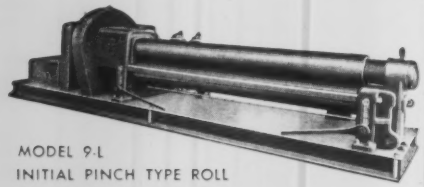
WEBB PLATE FABRICATING MACHINERY

PLATE BENDING ROLLS

The Webb Corporation offers a complete line of Plate Bending Rolls for the rolling of the thinnest plate up to plate 2½" thick. Offered in a variety of lengths and thicknesses. Constructed for the modern fabricating shop.



MODEL PBR-500
PYRAMID TYPE ROLL

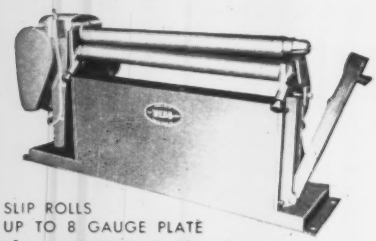


MODEL 9-L
INITIAL PINCH TYPE ROLL

Two types available: the Initial Pinch Type and Pyramid Type machines. All latest advantages of today's modern machine tools are incorporated, utilizing anti-friction bearings, totally enclosed gear drives. Special forming rolls for culvert pipe, stock tanks and other special shapes available.

SLIP ROLLS

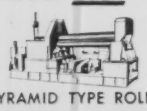
A complete line of small Sheet Metal Forming Rolls are also available. All power-driven with shaft sizes 3" to 5" for the handling of the thinnest gauge material, up to 8 gauge material. Special rolls for the forming of polished sheets, aluminum and stainless steels can be furnished. Complete catalogues on any size machine furnished upon request; write Dept. D.



SLIP ROLLS
UP TO 8 GAUGE PLATE

Let Speed PAY-The WEBB Way!

SLIP ROLLS



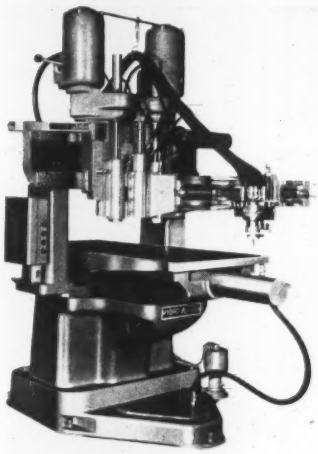
PYRAMID TYPE ROLL

INITIAL TYPE ROLL

STEELWORKERS

Also Manufacturers of INDUSTRIAL WEIGHING EQUIPMENT

Since 1881 THE WEBB® CORP.
WEBB CITY, MO., U. S. A.



tegrated with the machine. *Write*: Arrow Engineering Co. Inc., 11625 Waisingham Rd., Largo, Fla.

Kit Tests for Cracks

A low cost, combination yoke and coil, magnetic particle testing kit (YL-51) detects transverse and longitudinal cracks in ferrous parts. It demagnetizes the parts after the test.

This portable unit can be used in the plant or field for sampling inspection, light weld inspection, in-place maintenance, and heavy equipment overhaul inspection.

It can be operated from a 110-volt outlet or small portable generator. *Write*: Magnaflux Corp., 7300 W. Lawrence Ave., Chicago 31, Ill. *Phone*: Underhill 7-8000

Truck Action Improved

Hyster lift trucks of 15,000 to 20,000 lb capacity have improved features in the engine, power train, steering and hoisting mechanisms, and operator comfort.

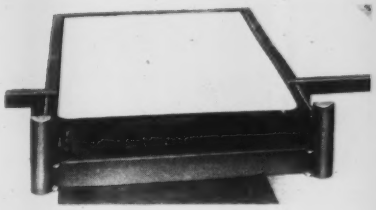
Three engine choices (diesel, gasoline, or LP gas) are available.

These large capacity units have a turning radius of 154 to 157 in. and lifting speeds of 59 to 74 fpm. The power steering mechanism supplies power for full steering arc regardless of engine speed. *Write*: Hyster Co., 1003 Myers St., Danville, Ill. *Phone*: 6-2400

Loading Ramp Is Rugged

The Rite-Hite Model 8A, fully automatic loading ramp (10-ton capacity) is designed for site assembly.

All parts and subassemblies are precision machined and welded for easy assembly.



It is constructed to take heavy truck and cross-dock traffic. The device is counterbalanced. *Write*: Loomis Machine Co., 135 Fourth St., Clare, Mich. *Phone*: Evergreen 6-9984

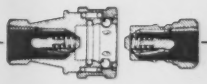
Wherever 2-way shut-off is required...

HERE'S THE COUPLING FOR THE JOB

HANSEN

SERIES HK®

TWO-WAY SHUT-OFF COUPLING



Shuts off both sides of line... prevents loss of liquid, gas or pressure

WRITE FOR THE HANSEN CATALOG

Here's an always ready reference when you want information on couplings in a hurry. Lists complete range of sizes of Hansen One-Way Shut-Off, Two-Way Shut-Off, and Straight-Through Couplings—including Special Service Couplings for L. P. Gas, Steam, Oxygen, Acetylene, etc.

To connect a Hansen Two-Way Shut-Off Coupling, you merely pull back the sleeve and push the Plug into the Socket. To disconnect, just pull back the sleeve. No tools required. When Coupling is disconnected, similar valves in Socket and Plug shut off both ends of line—practically eliminate spilling of liquid or escape of gas at instant of disconnection.

Hansen Series HK Two-Way Shut-Off Couplings are available with female pipe thread connections from 1/8" to 1" inclusive. Available in brass or steel.

SINCE 1915

REPRESENTATIVES IN PRINCIPAL CITIES

QUICK-CONNECTIVE FLUID LINE COUPLINGS

THE HANSEN MANUFACTURING COMPANY

4031 WEST 150th STREET • CLEVELAND 35, OHIO

NEW literature

Write directly to the company for a copy

Pallet Racks

Steel pallet racks for bulky, irregular, fragile, and odd lot materials are described in a brochure, EC-2018. Berger Div., Republic Steel Corp., 1038 Belden Ave. N.E., Canton 5, Ohio.

Steel Belt Conveyors

An engineering guide enables the engineer to design and specify his own steel belt conveyor. Sandvik Steel Inc., Fair Lawn, N. J.

Small Diecastings

This bulletin covers a wide variety of zinc alloy diecast and molded thermoplastic products. It is divided into sections that cover special and standard articles. Gries Reproducer Corp., 400 Beechwood Ave., New Rochelle, N. Y.

Group Relamping

A booklet covers a plan for group relamping that is applicable to stores, offices, industrial plants, or wherever large numbers of lamps are used. Dept. RL-58, Inquiry Bureau, General Electric Co., Nela Park, Cleveland 12, Ohio.

Investment Castings

How To Buy Investment Castings points out factors for judging investment castings and selecting casting supplies. Tips are given concerning whether a part should be considered for this precision process. Alloy Precision Castings Co., 3855 W. 150th St., Cleveland 11, Ohio.

Self-Dumping Hoppers

A brochure shows applications of self-dumping hoppers for handling scrap, waste, small parts, aggregates, ingots, and other bulk materials. Roura Iron Works Inc., 1400 Woodland Ave., Detroit 11, Mich.

Heat Exchangers

Catalog S-395 describes air cooled heat exchangers. Trane Co., La Crosse, Wis.

Cutting Machine

The Model 1-A Sever-All dry abrasive cutting machine is described in a folder, DH-106. The unit handles solids up to 2 in. square, pipe and tubing to 3½ in. OD, angle iron to 3 x 3, and channels to 4 in. Allison-Campbell Div., American Chain & Cable Co., Bridgeport 2, Conn.

R-F Induction Heating

A booklet describes the characteristics and functions of a wide variety of power tubes in R-F induction heaters. Sylvania Electric Products Inc., 1100 Main St., Buffalo 9, N. Y.

Oils and Packings

Government specifications met by a line of rust preventives, lubricants, metalworking processing aids, fire resistant hydraulic fluids, and hydraulic packings are listed with superseded specs in a booklet. E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.

Multiple Bar Automatic

Bulletin MRA-58 describes the 7/16 in. RA-6, the smallest Acme-Gridley multiple spindle bar automatic. It is for short or long run production of small to miniature components at a high rate with precision. National Acme Co., 170 E. 131st St., Cleveland 8, Ohio.

Hydraulic Circuits

A booklet covers air and hydraulic circuits in sequencing, semiautomatic and automatic cycling, dual pressure systems, safety systems, skip feed arrangements, and synchronization of two cylinders. JIC symbols are used. Logansport Machine Co. Inc., Logansport, Ind.

Universal Joints

Catalog No. IJ320-1 lists torque ratings, operating speeds, slip joint movement allowances, maximum operating angles, and dimensions for standard Spicer universal joints. Standard Equipment Div., Dana Corp., 253 Waggoner Blvd., Toledo 1, Ohio.

Cutting Torches

Form 1174 illustrates Oxweld flame cutting equipment. Units covered are for manual and machine cutting and are for use on every job from thin sheets to risers 10 ft thick. Linde Co., division of

Union Carbide Corp., 30 E. 42nd St., New York 17, N. Y.

Aluminum Stock

A technical brochure contains detailed information on hollow aluminum machining stock. Alloys are 2011-T3, 2017-T4, 2024-T4, and 6066-T6. Harvey Aluminum, 19200 S. Western Ave., Torrance, Calif.

Closed Circuit Television

Bulletin No. 2239 describes industrial television equipment, gives five basic suggestions for equipment selection, and gives case histories of successful operations. Dept. PW, Electronics Div., Diamond Power Specialty Corp., Lancaster, Ohio.

Mechanical Tubing

Data folder TB-428 describes how smooth inner diameter welded carbon steel tubing can cut production time in the manufacture of hydraulic cylinders. Tubular Products Div., Babcock & Wilcox Co., Beaver Falls, Pa.

Induction Heating

A bulletin describes high frequency induction heating equipment. Included is information on heat stations and generator control units, and data on heat treating, annealing, brazing, forging, and shrink fitting. Magnethermic Corp., 3990 Simon Rd., Youngstown 7, Ohio.

Fastener Application

Technical facts to help users obtain maximum economy and performance in application of standard fasteners are set forth in a booklet. Russell, Burdsall & Ward Bolt & Nut Co., 101 Midland Ave., Port Chester, N. Y.

Rotary Gas Pumps

Bulletin XA-458 covers rotary, positive, gas pumps that are now available in 18 size. Technical ratings and construction data are clearly presented to aid the selecting engineer. Roots-Connersville Blower Div., Dresser Industries Inc., 900 W. Mount St., Connersville, Ind.

Roller Chains

Precision Steel Roller Chains and Sprockets (Book 2657) contains 154 pages of detailed engineering data illustrating roller chain versatility in a wide range of power transmission and conveyor service applications. Dept. PR, Link-Belt Co., Prudential Plaza, Chicago 1, Ill.

Chromate Coatings

Fact Sheet No. F-2 is an aid to quick selection of the proper chromate sealing and brightening finishes for nonferrous metals. Conversion Chemical Corp., 98 E. Main St., Rockville, Conn.

Zinc Information

A quarterly newsletter, *The Zinc Spotlight*, provides information about the zinc industry of special interest to engineers, designers, fabricators, management, and students. American Zinc Institute Inc., 60 E. 42nd St., New York 17, N. Y.

High Strength Steel

A booklet describes the wide range of uses for the three grades of Kaisaloy—a prime high strength, low alloy steel. Kaiser Steel Corp., P.O. Box 58, Oakland 12, Calif.

Hand and Power Saws

Price selector catalog No. 58 covers hand and power hacksaws, holesaws, bandsaws, hammers, and ground flat tool steel. Capewell Mfg. Co., Governor Street, Hartford, Conn.

Hose Fitting Adapters

Catalog 4490 covers adapters for reusable Hoze-loc fittings for industrial hose. Parker Fittings & Hose Div., Parker-Hannifin Corp., 17325 Euclid Ave., Cleveland 12, Ohio.

Solid Film Lubricant

A bulletin describes Surf-Kote H-108, an easily applied, solid, dry film lubricant, containing molybdenum disulfide and utilizing a resinous bonding agent. Sales Promotion Dept., Hohman Plating & Mfg. Co., 814 Vermont Ave., Dayton, Ohio.

Floor Trucks

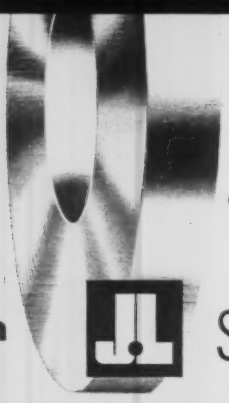
Circular 29-D describes 52 floor trucks including those with replaceable wooden decks, roller platforms, V-type decks, removable end and side racks, spring loaded decks, and steel shelving. Lewis-Shepard Products Inc., 125 Walnut St., Watertown 72, Mass.

Cutting costs without cutting corners is a specialty at Pennsalt. Ask your Pennsalt man how his *complete* surface preparation service can help you get "A BETTER START FOR YOUR FINISH."

METAL PROCESSING
DEPARTMENT 663
PENNSALT CHEMICALS CORP.
3 Penn Center, Philadelphia 2, Pa.

Pennsalt Chemicals
ESTABLISHED 1850

A better start for your finish



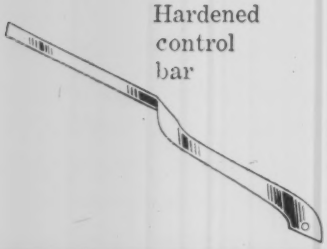
control your quality...

with J&L STAINLESS and STRIP DIVISION

cold rolled spring steel

The quality of your spring steel parts or products is only as good as the spring steel itself—its response, its performance. When you specify J&L it means all the advantages of most exacting quality control—from ore to finished coil. Particularly important is the opportunity to utilize J&L's Restricted Specification processing to achieve the qualities necessary for optimum end-results. With individual restricted specifications met, oftentimes production operations can be simplified and in many instances product quality improved. As an example look at this . . .

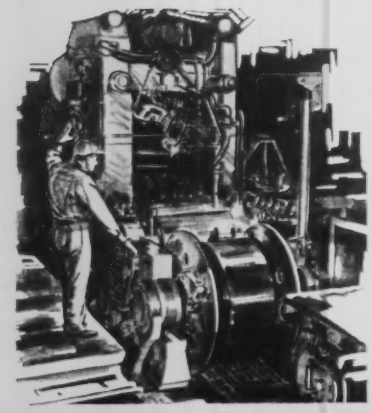
TYPICAL APPLICATION . . .

product	specification	results
 Hardened control bar	Spring Steel Analysis—AISI—1050 annealed Size 4½" x .042 Tolerance ± .0003 including crown Width tolerance ± .005 Temper—B78 Max. Finish—#2 Coil size 250/300 lbs. per in. width	Uniformity of shape and gauge made possible change from cut lengths to coils, reducing handling and inspection. Increased speed of production line. Amazing thickness control eliminated 2 quality control stations.

J&L STAINLESS and STRIP DIVISION produces a full line of restricted and standard specification strip steel in these grades and types:

Low Carbon	Electrolytic Zinc
High Carbon	Alloy
Tempered Spring Steel	Stainless

The experience, facilities and accumulated know-how of a specialized organization devoted exclusively to strip steel processing are available to work with you. In this clearing house of strip steel engineering and application information, it's a good bet there is something of value for you. Your inquiry will get our immediate, interested attention.



STRIP STEEL

Jones & Laughlin
STEEL CORPORATION
STAINLESS and STRIP DIVISION
YOUNGSTOWN 1, OHIO

Market Outlook

Steelmakers Hail Production Boom

LOOK FOR steelmaking operations to hit 85 per cent of capacity before yearend. Signs of recovery are so compelling that even the most conservative producers are getting bullish. A few weeks ago, 75 per cent was the most optimistic forecast.

Steelmakers who challenged the prediction that next year's output would be at least 110 million ingot tons are beginning to accept that estimate, but they don't think peak operations anytime next year will exceed 90 per cent. Reason: About 10 per cent of the industry's capacity is obsolete.

Producers won't use high cost facilities unless they have to and demand won't require 100 per cent operations unless consumers start hedging against a threatened steel strike.

AUTO ORDERS DELAYED— Because many of their plants are still strike bound, automakers are ordering steel sparingly and asking suppliers to delay shipments. It's estimated that General Motors Corp. has put holdup tags on about two weeks' tonnage, mostly cold-rolled sheets. The delays don't permit much diversion of the metal to other users because they're not in effect long enough for the mills to alter specifications.

BUYERS BUILD INVENTORIES— When the recession began, consumers cut their steel inventories drastically. Now, with the first signs of better business, they're hastily rebuilding their stocks. As a result, steel production is recovering faster than the metal consuming industries.

Demand for the light, flat-rolled items (cold-rolled sheets, tin plate, galvanized products) is so great that many mills making them are running close to capacity. Producers of cold-rolled sheets are booked through November and well into December. Leading consumers include the automotive, appliance, construction, and container industries.

PIPE SALES SPOTTY— Oil producers are overloaded on specialties (heavy-walled tubes, joints, and high tensile steels) but understocked on the bread-and-butter items. Hard pressed for cash, they buy only what's indispensable and rely on distributors for quick delivery. Standard pipe shipments will probably top last month's by a small margin, but order volume shows little improvement. Sales of mechanical tubing are markedly better, thanks to automotive demand.

BARS ON UPSWING— Harder hit than most products during the period of inventory liquidation, hot-rolled carbon bars are once again in demand. Automakers, converters, and fastener manufacturers are among the most active buyers. An eastern producer expects its October shipments to top last month's by 10 per cent; November shipments will be 10 per cent better than October's, it believes. Chicago mills sold out their October rollings of small sizes by Oct. 13.

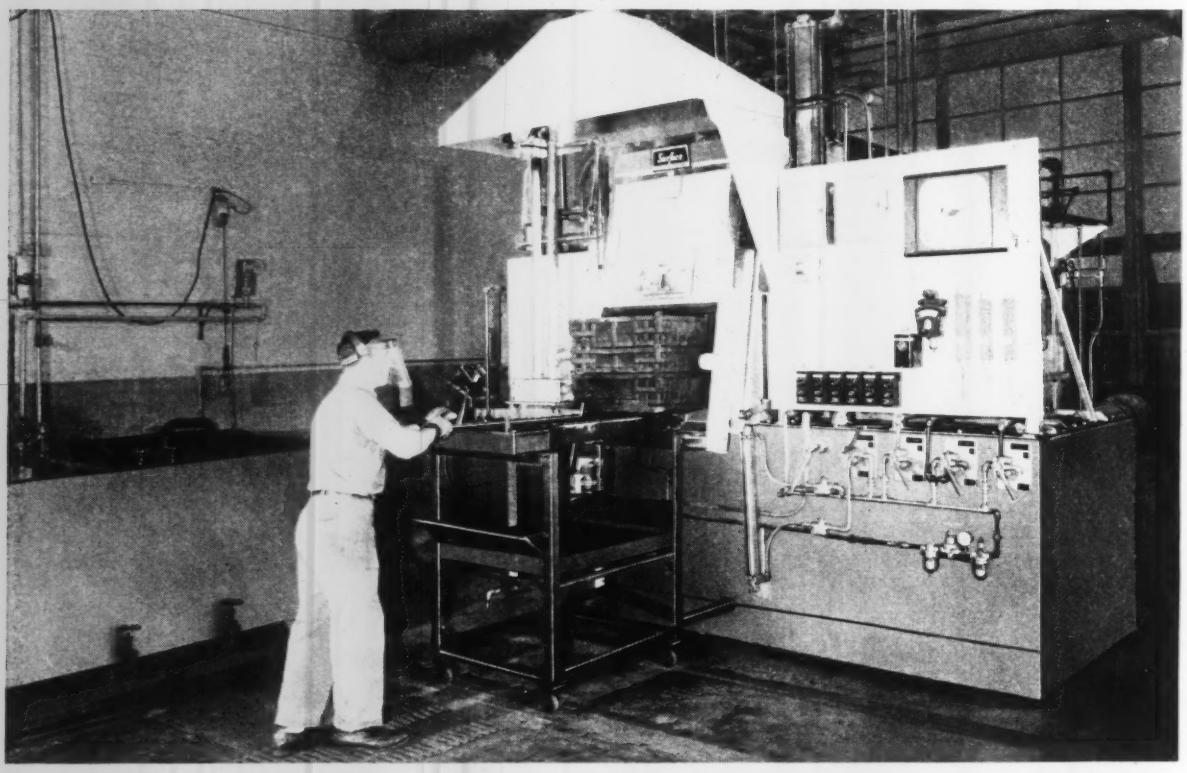
PRODUCTION SURGES— Answering the call for more steel, producers relighted additional furnaces last week. The ingot rate jumped 2.5 points to 74 per cent of capacity, a new high for the year. Production was about 1,997,000 net tons of steel for ingots and castings, the largest of any week since that ended Nov. 3, 1957.

SCRAP PRICES LAG— Although steelmaking operations have advanced nearly 10 points during the last month, scrap prices have changed little. Last week, STEEL's composite on the prime grade held unchanged at $42.33. A month ago it was $43. Mill inventories are still substantial, partly because some buyers had the foresight to accumulate small tonnages in late summer. As their stocks dwindle, steelmakers are relying on home scrap and hot metal.

WHERE TO FIND MARKETS & PRICES

	News	Prices
Bars, Merchant	298	304
Reinforcing	298	305
Boiler Tubes	...	307
Clad Steel	...	308
Coke	...	312
Coal Chemicals	...	312
Charts:		
Finished Steel	...	303
Ingot Rate	302	...
Scrap Prices	...	315
Comparisons	...	303
Contracts Placed	321	...
Contracts Pend.	321	...
Electrodes	...	312
Fasteners	...	307
Ferroalloys	296	...
Flourspar	...	312
Footnotes	...	307
Imported Steel	...	312
Ingot Rates	302	...
Metal Powder	...	312
Nonferrous Met.	318	320
Ores	315	312
Pig Iron	296	310
Piling	...	304
Plates	299	304
Plating Material	...	321
Price Indexes	...	303
Producers' Key	305	...
R.R. Materials	...	307
Refractories	...	312
Scrap	315	316
Semifinished	302	304
Service Centers	301	310
Sheets	297	305
Silicon Steel	302	306
Stainless Steel	...	308
Strip	297	306
Structurals	301	304
Tin Mill Prod.	321	306
Tool Steel	...	308
Tubular Goods	299	308
Wire	299	306

Allcase® furnace clips cost ½ on manicuring implements



One man and one furnace now match the former production of two men and two furnaces in this plant. Added to this gain are two others: greater versatility in processing, and finished work of uniformly high quality. The latter is especially important to this manufacturer of manicuring implements, because he offers a lifetime guarantee on many of his products.

The "hero" of this story is the Surface Allcase® furnace, which is used for hardening, carbonitriding, carburizing, and annealing. Controlled atmosphere is supplied by a Surface MRX® gas generator. Work handling and atmosphere control can be completely automatic, if you wish. Why don't you find out about this profitable furnace now?

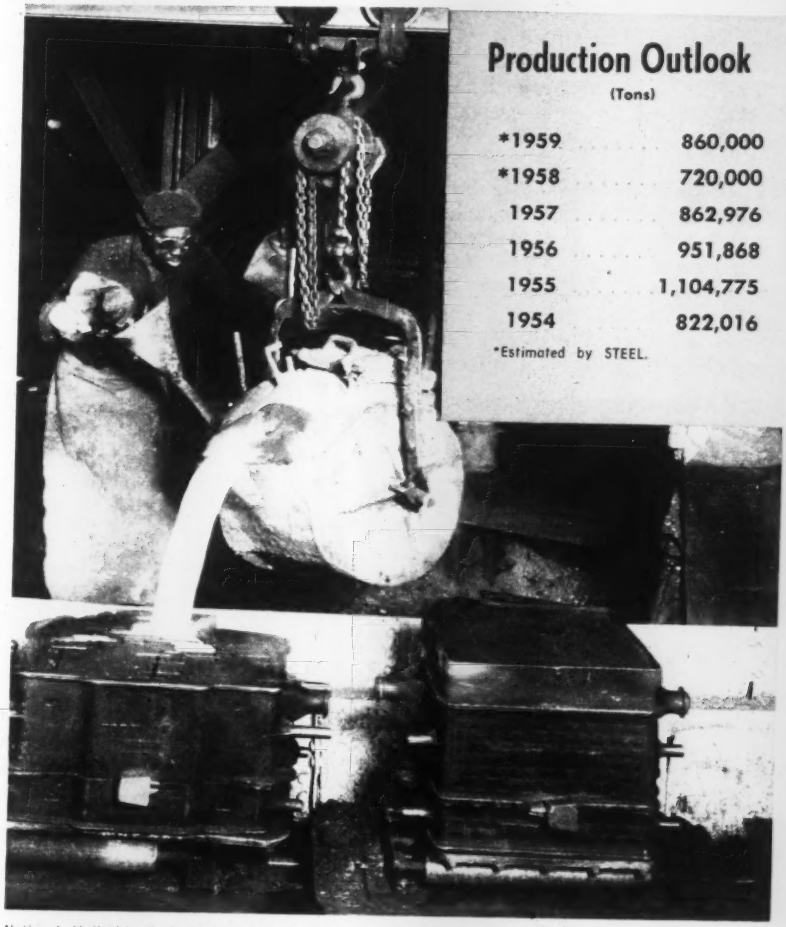
Write for Bulletins SC-163 and SC-174.

Surface Combustion Corporation, 2385 Dorr St., Toledo 1, Ohio. In Canada: Surface Industrial Furnaces, Ltd., Toronto, Ontario.

See new Autocarb® Systems at the Metal Show, Booth 321

Surface

wherever heat is used in industry



National Malleable & Steel Castings Co.

Production Outlook

(Tons)

*1959	860,000
*1958	720,000
1957	862,976
1956	951,868
1955	1,104,775
1954	822,016

*Estimated by STEEL.

Malleable Sales Move Up

Pickup is gaining momentum, but auto production is vital to prosperity. The industry, pushing diversification, is eying the consumer durable goods field

THE PICKUP first noticed by malleable founders in August is gaining strength. The industry now expects the fourth quarter to be its best sales period of the year—although this year's performance will probably be 15 per cent below last year's.

Here's a summary of the overall situation:

Prices: Officially, they're stable, but some price cutting is reported.

Costs: They're up 3 per cent. Increasing costs and improved demand are slowing price competition, and may trigger a general price boost in 1959.

Backlogs: The average is 18 working days.

Trend: Stabilization of the industry through aggressive marketing.

Target: Consumer durable goods industry.

• **Two Key Industries**—Auto production, cause of many woes this year, will again be vital in 1959. The railroads are expected to help business as increased freight loadings force them to buy new cars and reactivate and repair those which were pulled out of service during the slump.

Diversification is the key word in the industry. Foundries are exploring new fields with the aim of offsetting the cyclical pattern caused by auto demands.

Says Lowell D. Ryan, executive vice president of the Malleable Founders' Society: "Applications of malleable castings in vehicles have remained about the same the last few years. If we lose one, we gain another. Our growth depends upon broadened markets."

R. C. Hobson, vice president and general manager, industrial division, National Malleable & Steel Castings Co., Cleveland, agrees. "The malleable industry has not done the job of marketing the product deserves," he maintains.

"The area having the greatest growth potential," says Mr. Ryan, "is the consumer goods industry. Many appliance parts, such as high strength hinges, special fasteners, and motor mountings could be made of malleable iron cheaper, with higher, more uniform quality. Only better marketing techniques will get us that business."

• **Fasteners Are Cast**—An example of a new application is the casting of small T-type bolts by Canton Malleable Iron Co., Canton, Ohio. Casting solved a strength problem, and the bolt is said to be 33 per cent cheaper than the one it replaced.

Another recent application: A spring seat for boat trailers, developed by Texas Foundries Inc., Lufkin, Tex. Savings: 48 per cent of the cost of the part it replaced.

• **Pearlitic Volume Up**—The use of pearlitic malleable continues to expand. It accounted for about 15 per cent of malleable volume in 1957. STEEL asked a number of founders to compare this year's and last year's production of pearlitic in proportion to total output. Only one reported no change. The rest had increases.

Mr. Ryan adds this note of caution: "Use of pearlitic will continue to grow but more slowly now as it finds its own level and takes

its place among other forms of casting."

• **Implement Makers Buying**—Sales to the agricultural implement makers have been better this year than last. "But," says W. Scott Roby, president of Peoria Malleable Castings Co., Peoria, Ill., "agricultural business this year still cannot be called good because 1957 was terrible."

Overproduction in 1955 and 1956 resulted in a flooded agricultural implement market in 1957. Dealers, seeing the beginning of the downtrend, lived off their fat inventories. The market held relatively well, pushing down inventories and forcing the dealers to replenish their stocks this year.

• **Price Cutting Seen**—Some price competition has been reported, but it is expected to die out as costs and demand go up.

One midwest producer says he has been involved in price competition all year, but because of rising costs, he is alerting his customers to a 5 per cent increase by Jan. 1. "Most customers," he says, "are sympathetic and will go along when the increase comes."

Foundries in STEEL's sample report that on the average costs are 3 per cent over their Jan. 1 level, but they say they have held the price line.

• **Inventories Still Down**—Despite the pickup, inventories remain low. Mr. Ryan says: "The reason there is any inventory at all is that shops can handle only so many immediate delivery orders. The rest must wait."

Backlogs are expected to take an upward turn as automakers settle their labor troubles and go into full production. But caution is still the byword of the auto industry. Malleable backlogs will remain substantially under the 1956 and early 1957 figures.

Pig Iron . . .

Pig Iron Prices, Page 310

Demand for merchant pig iron is continuing to show a slight upturn, but it is lagging behind the improvement in general business. Automotive foundries have been suffering from scattered strikes in the industry during the last two or three weeks. These have resulted in holdbacks in iron and coke shipments.

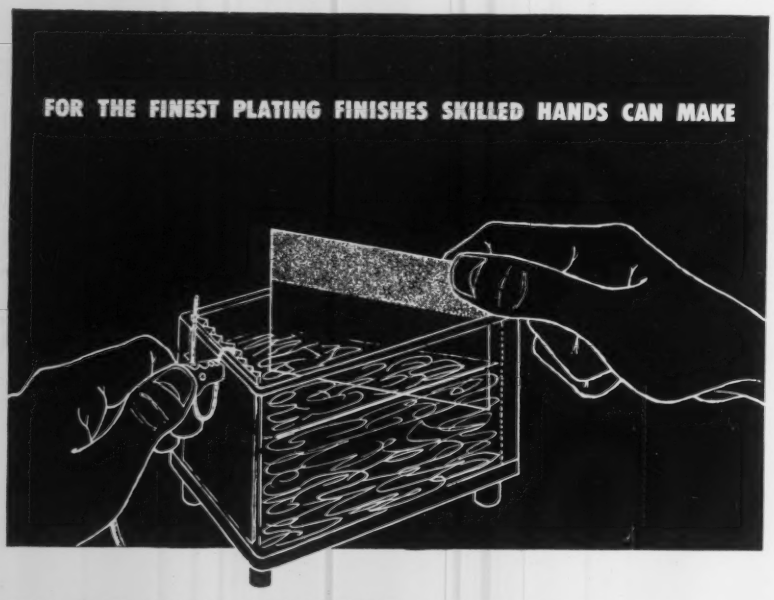
Practically no buying for inventory accumulation has been reported, although most foundries have well under 30 days' supply on hand.

Blast furnace operations are being increased rapidly in anticipation of heavier demand for merchant iron over the balance of the year and to cover requirements of steelmakers.

Ferroalloys . . .

Production of silicon alloys and silicon metal during the second quarter, 1958, dropped 46 per cent, compared with output in the first quarter, reports the U. S. Bureau of Mines. Shipments in the period were off 5 per cent.

Shipments (silvery pig iron, ferrosilicon, silicon briquets, silicon metal, and miscellaneous silicon alloys) totaled 100,912 tons in the second quarter, vs. 105,821 in the preceding three months. In addition, producers used 10,272 tons in



CALL FOR THESE PACE-SETTING ROHCO® PRODUCTS, DISCOVERED AND CONTROLLED IN THE HULL CELL:

For unequalled, perfect Cadmium Plating . . .

ROHCO 20XL CADMIUM BRIGHTENER

For brilliant, low cost Zinc Plating . . .

ROHCO 100 BARREL ZINC BRIGHTENER
ROHCO 503 STILL AND AUTOMATIC ZINC BRIGHTENER

For retained beauty and added corrosion resistance . . .

RODIPS CD-3 AND CD-4 ON CADMIUM PLATE
RODIPS ZN-22 AND ZN-30 ON ZINC PLATE

For high-speed, full-bright Cyanide Copper . . .

ROHCO RO-BRIGHT COPPER PLATING PROCESS

Can you point with pride to your plated finishes? Nothing but the finest finishes — like the superb quality achieved by ROHCO Products—can put you in the best competitive position and win satisfied customers.

ROHCO Products assure highest quality and absence of rejects are a matter of course in daily production. Keep in mind that these products *must* have a wide latitude of operation and ease of maintenance to earn the ROHCO Trade Mark.

Your Nearby ROHCO Representative is eager to work with you . . .

ROHCO

------ **Nationwide Stockpoints** ------

R. O. HULL & COMPANY, INC.

1309 Parsons Court • Rocky River 16, Ohio

producing other silicon alloys. Total shipments for the first six months were 206,733 tons.

Imports amounted to 2955 tons, and exports 259 tons in the second quarter, compared with first quarter imports of 2199 tons and exports of 361. First six months totals: Imports, 5154 tons; exports, 620. Ferrosilicon imports during the second quarter contained 514 tons of silicon valued at $231,466; exports of 259 tons were valued at $78,545.

Apparent second quarter consumption was 103,608 tons, vs. 107,659 in the first three months. The six months total was 211,267 tons.

Production of silvery pig iron in second quarter totaled 11,736 tons, vs. 49,569 in the first three months. Silvery shipments were 26,312 tons, vs. 24,663.

Sheets, Strip . . .

Sheet & Strip Prices, Pages 305 & 306

"Automotive orders haven't really broken loose yet," says a Pittsburgh sheetmaker. "Even though the Big Three (GM, Ford, and Chrysler) have negotiated new labor contracts on a national basis, local strikes are curtailing production. Purchasing agents still ask us to delay shipments until normal operations are resumed."

Despite the retarded automotive shipments, considerable new auto business has been booked. Buffalo steelmakers, for example, say the recent heavy influx of orders (which boosted steelmaking sharply) was largely from the auto builders. Steel executives, generally, are cheered by reports the new model cars are moving well at retail. They see this as the forerunner of an active sheet demand (and other steel products) over the next couple months.

It's said that if auto demand gains over coming weeks, cold-rolled sheet supply could become noticeably tight, with pressure developing from such miscellaneous users as office furniture manufacturers, and makers of light drums.

Steady Market Pattern—In general, demand for sheets is showing steady improvement. Shipments to appliance and furniture manufacturers are better.

While some hot sheet tonnage can be had within three weeks, shipments range four to five weeks. On cold rolled, promises run five to eight weeks. Galvanized tonnage is being offered in six to eight weeks, in some cases even longer.

Certain makers of electrical sheets (which are moving better) and of enameling stock, have little tonnage left for shipment this year. This is particularly true of the lighter gages of enameling sheets. One producer of stainless sheets and strip is quoting December delivery.

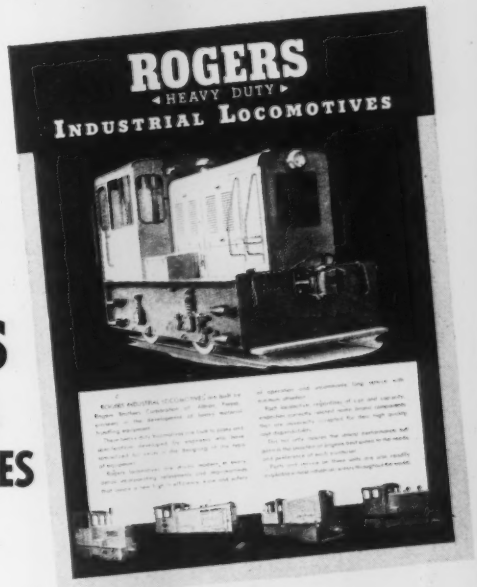
Cold Rolled Tightest—Of all the light, flat rolled products, supply of cold-rolled sheets is tightest. Some midwestern mills are booked full through November. A Chicago area producer has only about two weeks tonnage open in December. Leading buyers are appliance manufacturers, including stovemakers.

The upturn in appliance business developed rather suddenly. By the time many makers decided to increase their manufacturing schedules, they were unable to get some components as fast as they needed them.

Hot Sheets Moving—A consider-

Everyone Responsible *for* Material Movement

should have this folder featuring ROGERS INDUSTRIAL LOCOMOTIVES



It illustrates and describes advanced features that assure greater hauling efficiency, easier control and a longer life of useful service.

5 to 40 tons capacity. Track gages 21 to 56½ inches. Diesel or gasoline engines. Hydraulic or electric transmissions. Improved exhaust scrubber. Unit welded frames and cabs. Locomotives designed to meet special requirements.

Write today for literature.

ROGERS BROTHERS CORPORATION
ALBION, PENNA.

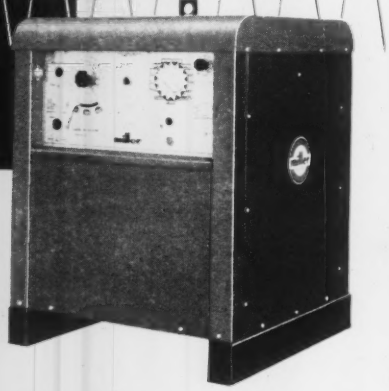
able tonnage is going for processing into strip, and for furnace and heating equipment. Also, barrel and heavy drum requirements are substantial. Demand for fuel oil tanks is seasonally past its crest, but volume continues to be substantial. In general, there's better buying for stock, as well as for immediate consumption.

Jones & Laughlin Steel Corp., Pittsburgh, is producing a new zinc-coated sheet in a high strength, low alloy grade of steel.

Lukens Steel Co., Coatesville, Pa., has successfully rolled the widest sheet of high-strength steel ever produced. For use in rocket motors, it is 160 in. wide, and about one-third thicker than the widest sheet hitherto produced by the "pack-rolling" method. It is twice as wide as material rolled on commercial sheet mills.

Revised quality extras for certain hot rolled sheets rolled to some plate specifications were made effective Oct. 10 by Inland Steel Co., Chicago, as follows: ASTM, A-212 or ASME, SA212, Grades A or B flange quality, $1.75 per 100 pounds. Grades A or B, firebox quality, $1.80. ASTM Code 1056, Grade A, flange quality, $1.85. The new schedule represents advances of 20 to 40 cents per 100 pounds.

NEW
miller
BALANCED WAVE
ELECTRIC CONTROL WELDER



Brings out BEST in TIG Welding

This new Miller development improves quality, speed and range of tungsten inert gas welding in all automatic fixture and manual applications. Balanced wave (BW) characteristic results from new Miller balance control which eliminates the d-c component present in most welding currents. Output of the Miller BW welder is ONLY pure a-c, DELIVERS:

Excellent arc stability
Maximum heat
Deeper penetration
Faster welding speeds

Complete particulars will be sent promptly upon request.

miller ELECTRIC MANUFACTURING COMPANY, INC., APPLETON, WISCONSIN
Distributed in Canada by Canadian Liquid Air Co., Ltd., Montreal

Reinforcing Bars . . .

Reinforcing Bar Prices, Page 304

So long as good building weather continues reinforcing steel will move well. Contractors at most points are pushing to beat the arrival of cold weather, and the mills are still booking orders for steel for bridges, other highwaywork and general construction.

Bar rolling mills in the Pacific Northwest report they are engaged at about 75 per cent of capacity. Their business is spotty, though, and their backlogs are not large.

Steel Bars . . .

Bar Prices, Page 304

Trading in merchant bars has noticeably improved. Consumption is better and users are showing some disposition to build inventories. Brighter prospects in the automotive industry are leading to more active buying, not only by interests associated with that field, but other lines of manufacture as well.

Sales are rocketing to a new high for the year at Pittsburgh, reflecting more active buying by automakers, converters, and fastener makers. One district mill expects its October shipments to top September's by 10 per cent. It is thought November tonnage will be up 10 per cent.

Eastern sellers say that while demand is up appreciably, there's room for improvement. District buyers are still not having much trouble getting tonnage into the forthcoming rolling cycle. But inquiries from fastener makers are up sharply, and steel service centers (warehouses) are beginning to buy more freely.

On small sizes, rolling schedules in the Midwest are filled through October. Despite the fact nearby shipments of hot bars are still available, consumers are doing a little more buying for stock, as well as for immediate consumption. In some cases, orders that had been held up by automotive labor negotiations are being released. In other instances, users are replenishing depleted inventories.

Demand for cold-drawn carbon and alloy bars is better, but improvement in this area of the market is not as noticeable as in the hot carbon grades.

Arsenals and other government shops are buying in heavier volume. Wyckoff Steel Co., Pittsburgh, booked 135 tons of cold-finished carbon bars from Raritan Arsenal, Metuchen, N. J. Boston Navy Yard closes shortly on 115 tons of 3/4-in. alloy bars.

Wire . . .

Wire Prices, Pages 306 & 307

Wire products are moving in greater volume, especially the items in industrial categories. Automotive requirements are up, and the betterment in this market area is stimulating consumer interest generally.

Producers of high carbon specialties in New England report sales are 25 to 30 per cent larger than they were in second quarter.

Although automotive buying is noticeably heavier, increased buying for the most part is spread out among industrial users and is attributed to inventory replacement and a general improvement in end-use requirements. The pickup includes such items as shade roller wire, extending through to springs and fasteners.

Wire mesh is moving, but buyers are not pushing for tonnage like they were some time back. This, of course, reflects the seasonal slackening in construction.

Tubular Goods . . .

Tubular Goods Prices, Page 308

Some mills are stepping up oil country goods shipments to warehouses in the Southwest, but the move doesn't reflect much improvement in sales. Distributors are putting their inventories in shape for the winter, when barge deliveries must be suspended.

Oil producers say pipe supplies are excessive. They're overloaded with specialties (heavy walled tubes, joints, and high tensile steels) but they're understocked on bread-and-butter items. Short on cash, they buy only what's indispensable and rely on distributors for quick deliveries.

Standard pipe shipments of one Pittsburgh area mill are expected to top last month's by a small margin. Order volume shows a little improvement with order backlog low.

Sales of mechanical tubing are on the upswing as automakers begin full production of 1959 models.

Plates . . .

Plate Prices, Page 304

Although October plate bookings are running a little ahead of September volume, deliveries continue easy. Sheared plates are available in two to three weeks, strip-plate, three weeks, and universal plates, two to three weeks.

Shipwork is well sustained, and the outlook for railroad carwork is a little more promising. Construction requirements, though, are off, and there is a continued lag in machine tool and industrial equipment needs.

Midwestern sellers think both plates and shapes will be "drag" items during the fourth quarter. Production is only 50 to 75 per cent of capacity, but though demand is

From first heat to heat treat . . .

LOFTUS

designs and builds them better

COVER TYPE
ANNEALING FURNACES

DIRECT-FIRED SINGLE-STACK

Generally Recommended
for
Greater Productivity per Investment Dollar
and
Flexibility with Economy

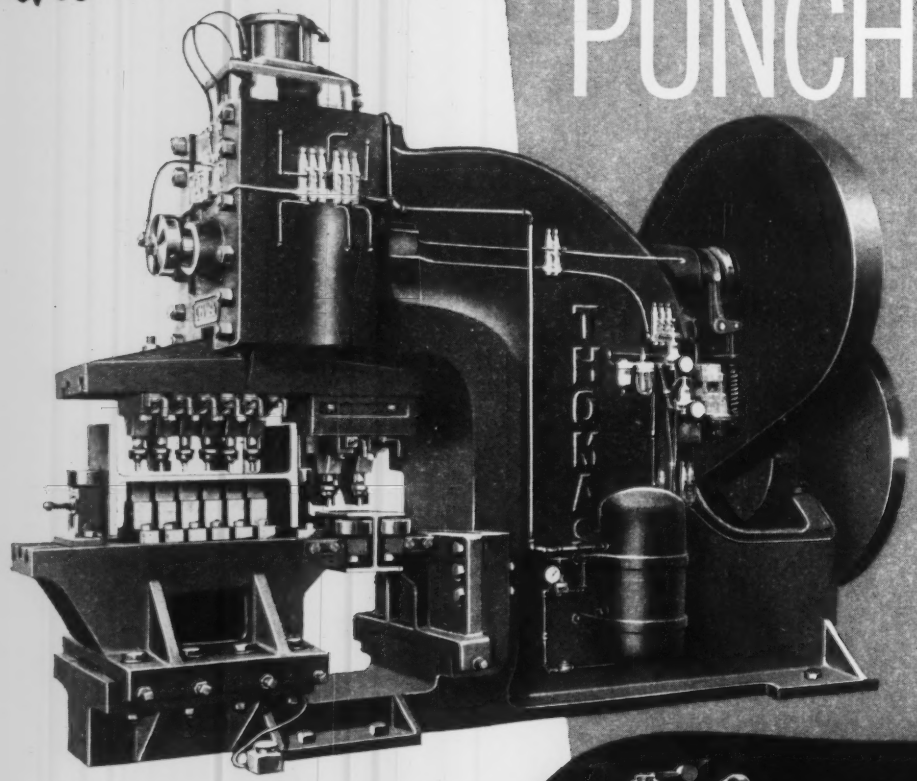
When warranted by special conditions, radiant tube or multiple stack construction are also available.

LOFTUS
Engineering Corporation
1 Gateway Center, Pittsburgh, Pa.

57.12.4

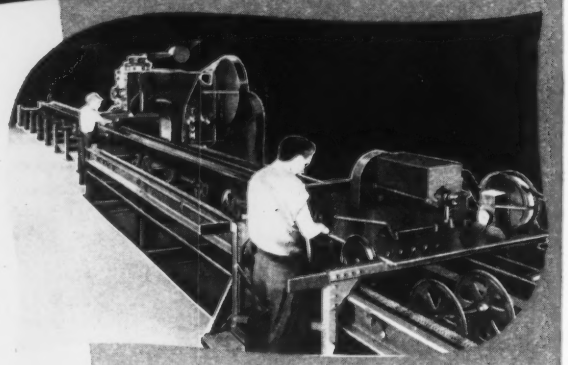
the trend is to THOMAS

for the most modern in BEAM PUNCHES



Modern design and quality construction...these are the factors required to lower your punching costs. You'll find these advantages in the Thomas line of new Beam Punches... in models of from 100 to 400 ton capacities.

Multiple tool setups for flanges and webs permit continuous operation through a wide range of sizes without money-consuming delays for tool changes. Quality construction throughout provides insurance against costly down time!



The Thomas Beam Punch-Motorized Spacing Table combination produces the ultimate in production efficiency for the medium tonnage shop. With the Spacing Table, accurate hole spacing is assured without layout, and material handling is reduced to the bare minimum.

Write for details!

THOMAS
MACHINE MANUFACTURING CO.
PITTSBURGH 23, PA.

Punches • Shears • Presses • Benders • Spacing Tables

40

improving, fabricators still have stocks to liquidate.

Homestead Works, U. S. Steel, is producing alloy plates weighing nearly 50,000 lb each, for use in ship construction.

Distributors . . .

Prices, Page 310

Steel service centers are booking slightly larger tonnages as metalworking activities pick up. Improvement in their business is nowhere near as large as that being registered by the steel mills.

Distributors' orders are about 7 per cent ahead of last month's in most districts. An exception is recorded by a leading interest in Philadelphia due to labor difficulties.

Demand for heavier products (plates, structurals, bars, and bar shapes) is better than that for specialties. Buying is confined chiefly to immediate needs, rather than for stock accumulation.

Shortages of some specifications of plates have unbalanced distributors' inventories in Los Angeles. Unless district mills divert more tonnage to plate production, the shortage could become critical when automotive requirements increase to the expected level.

Structural Shapes . . .

Structural Shape Prices, Page 304

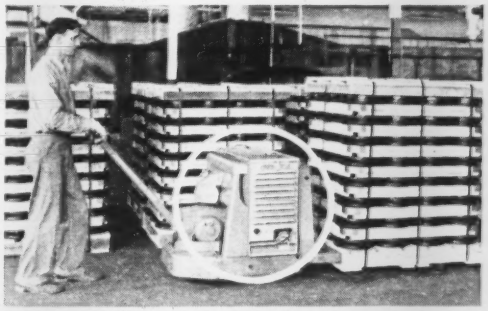
Seasonal slackening in structural steel market activity is developing. Still, considerable work continues to be figured, particularly public construction projects of various kinds, including bridges and schools.

In the East, bridge and highway needs predominate in the market. Bridges and schools account for the bulk of estimating in New England. The number of bridges out for bids there is larger, but total tonnage is under that earlier this year.

The market is highly competitive, especially among the smaller fabricators who have relatively little in the way of backlogs. The increase in plain material prices last August has not been reflected to any noticeable extent in prices for structural steel in place.

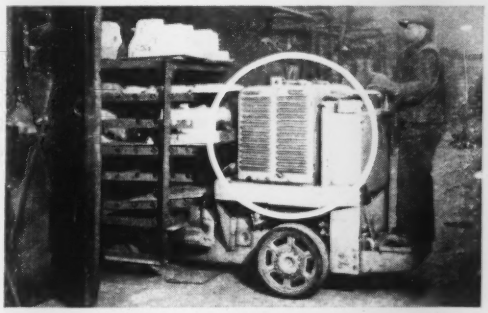
Dominion Bridge Co., Barnaby, British Columbia, is low bidder at $2,685,000 for construction of the

Get the Advantages of READY-POWER on Your Electric Industrial Trucks



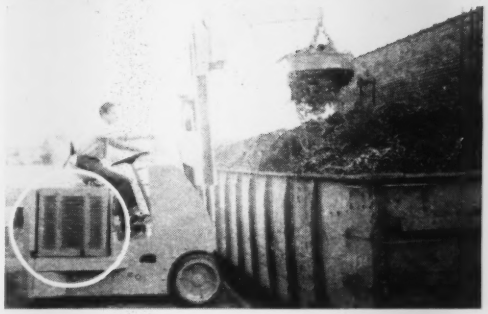
Get Live Power for Walkie Trucks

Ready-Power's popular bantam model "W" is equipped with dependable 12-volt automotive-type starting and ignition. Variety of idling speeds and easy accessibility make it ideal for all walkie trucks as well as rider trucks up to 2,000 lbs.



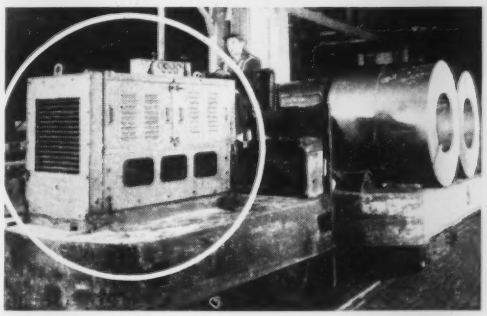
Work Your Fork, Platform, Tractor Trucks 'Round the Clock

Ready-Power gas-electric and LPG-electric units give materials handling trucks continuous, full power all the time. Slowdowns due to power fatigue are eliminated. The simple, all-electric control and live response make Ready-Power-equipped trucks rate high with truck operators.



Energize Lift Magnets on Your Electric Trucks

In the application shown at the left, the Ready-Power unit not only powers the truck, but also energizes the lift magnet for handling scrap metal. Ready-Power units are removable for shop adjustment while a spare keeps trucks working.



Get Diesel Electric for Lowest Ton-Mile Costs

Take a tip from the owners of industry's biggest trucks . . . power them with Ready-Power diesel-electric for maximum stamina, dependability, and lowest operating costs. Ready-Power offers power for every size and make of electric truck.

Your Truck is No Better than its Power . . . Write for Information on Ready-Power gas-electric, LPG-electric, and Diesel-electric Units

READY-POWER

The READY-POWER Co., 3824 GRAND RIVER AVE., DETROIT 8, MICH.

Manufacturers of Gas and Diesel Engine-Driven Generators and Air Conditioning Units; Gas and Diesel-Electric Power Units for Industrial Trucks

proposed 2300-ft Peace River Bridge, on the Alaska Highway, near Taylor, B. C. This span will replace the one that collapsed some time ago.

Since the beginning of this month, Acme Steel Co., Chicago, has been making and marketing a new framing material, AIM brand slotted angle. The company no longer manufactures a product known as Dexicon slotted angle.

Semifinished Steel . . .

Semifinished Prices, Page 304

Burgeoning demand for steel products, especially light, flat-rolled, on automotive and appliance accounts, is pushing steelmaking operations steadily upward. Last week, the national ingot rate hit 74 per cent of capacity, highest since mid-November a year ago, and equal to output of about 1,997,000 net tons, largest for any week since that ended Nov. 3 last year.

Blast furnace operations are also rising. Steelmakers are blowing in idle stacks as the need for hot metal keeps in step with the advancing ingot rate.

Steel Production Rises

Steel production totaled 7,611,000 net tons in September, largest for any month this year, reports the American Iron & Steel Institute. Output in August was 7,296,003 tons, and in September a year ago it was 8,977,906.

Third quarter output amounted to 21,317,408 tons, vs. 18,961,630 in the second quarter, and 27,120,528 in the third quarter, 1957.

Production in the first nine months of the year totaled 59,069,895 tons, down sharply from the 87,704,075 tons produced in the like period last year.

The institute's index of steelmaking for September was 110.6 in terms of the basic index of average production during 1947-49. It compared with 102.4 in August, and 130.4 in September last year. The index figure for the third quarter was 101 against 90.8 in second quarter and 128.5 in third quarter a year ago. The index for the first nine months was 94.3, against 140 in the comparable 1957 period.

Based on Jan. 1, 1958 capacity of 140,742,570 net tons annually, steelmaking facilities were utilized at an average of 65.8 per cent during September. That compared with 61 per cent in August. The capacity figure for the first nine months was 56.1, while the third quarter figure was 60.1 per cent.

Steel Ingot Production—September, 1958

Period	—OPEN HEARTH— Net tons	Per cent of capacity	—BESSEMER— Net tons	Per cent of capacity	—ELECTRIC— Net tons	Per cent of capacity	—TOTAL— Net tons	Per cent of capacity
1958								
January	6,085,124	58.6	121,338	35.5	547,440	44.8	6,753,902	56.5
February	5,252,112	56.0	81,597	26.4	448,614	40.6	5,782,323	53.6
March	5,598,944	53.9	122,317	35.8	533,361	43.6	6,254,622	52.3
1st Qtr.	16,936,180	56.2	325,252	32.8	1,529,425	43.1	18,790,857	54.1
April	4,875,619	48.5	109,433	33.1	547,939	46.3	5,532,991	47.8
May	5,602,123	53.9	110,366	32.3	588,670	48.2	6,301,159	52.7
June	6,378,942	63.4	88,125	26.6	660,413	55.8	7,127,480	61.6
2nd Qtr.	16,856,684	55.3	307,924	30.7	1,797,022	50.1	18,961,630	54.0
1st 6 Mo.	33,792,864	55.7	633,176	31.7	3,326,447	46.6	37,752,487	54.1
July	5,712,587	55.0	114,218	33.4	593,600	48.6	6,420,405	53.7
*August	6,481,185	62.4	134,435	39.3	670,383*	54.8	7,286,003	61.0
†September	6,771,000	67.3	103,000	31.1	737,000	62.3	7,611,000	65.8
†3rd Qtr.	18,964,772	61.5	351,653	34.6	2,000,983	55.2	21,317,408	60.1
9 Mo.	52,757,636	57.7	984,829	32.7	5,327,430	49.5	59,069,895	56.1
1957								
January	9,829,691	99.0	294,839	77.1	884,232	86.5	11,008,762	97.1
February	8,898,671	99.2	227,682	80.4	810,853	87.8	9,987,206	97.6
March	9,442,164	95.1	275,156	71.9	871,754	85.2	10,589,074	93.4
1st Qtr.	28,170,526	97.7	847,677	76.3	2,566,839	86.4	31,585,042	96.0
April	8,820,328	91.8	231,731	62.6	762,721	77.1	9,814,780	89.5
May	8,842,707	89.1	201,864	52.8	747,752	73.1	9,792,323	86.4
June	8,498,903	88.4	210,915	57.0	681,584	68.9	9,391,402	85.6
2nd Qtr.	26,161,938	89.8	644,510	57.4	2,192,057	73.0	28,998,505	87.2
1st 6 Mo.	54,332,464	93.7	1,492,187	66.8	4,758,896	79.7	60,583,547	91.5
July	8,086,519	81.4	194,638	50.9	627,575	61.4	8,908,732	78.6
August	8,297,172	83.6	204,723	53.5	731,995	71.6	9,233,890	81.5
September	8,135,139	84.7	185,967	50.2	656,800	66.4	8,977,906	81.8
3rd Qtr.	24,518,830	83.2	585,328	51.5	2,016,370	66.4	27,120,528	80.6
9 Mo.	78,851,294	90.2	2,077,515	61.7	6,775,266	75.2	87,704,075	87.9
October	8,348,522	84.1	154,577	40.4	694,618	67.9	9,197,717	81.1
November	7,674,698	79.9	134,709	36.4	583,512	59.0	8,392,919	76.5
December	6,783,262	68.3	108,237	28.3	528,686	51.7	7,420,285	65.5
4th Qtr.	22,806,482	77.4	397,623	35.0	1,806,816	59.5	25,010,921	74.4
2nd 6 Mo.	47,325,312	80.3	982,951	43.3	3,823,186	63.0	52,131,449	77.5
Total	101,657,776	87.0	2,475,138	54.9	8,582,082	71.3	112,714,996	84.5

Note—The percentages of capacity operated are based on annual capacities as of Jan. 1, 1958, as follows: Open hearth 122,321,830 net tons; bessemer 4,027,000 net tons; oxygen process, electric and crucible 14,393,740 net tons. Total for 1958, 140,742,570 net tons. For 1957, the capacity tonnages are: Open hearth 116,912,410 net tons; bessemer 4,505,000 net tons; oxygen process, electric and crucible 12,041,740 net tons. Total for 1957, 133,459,150 net tons.
*Revised. †Preliminary.

DISTRICT INGOT RATES

(Percentage of Capacity Engaged)

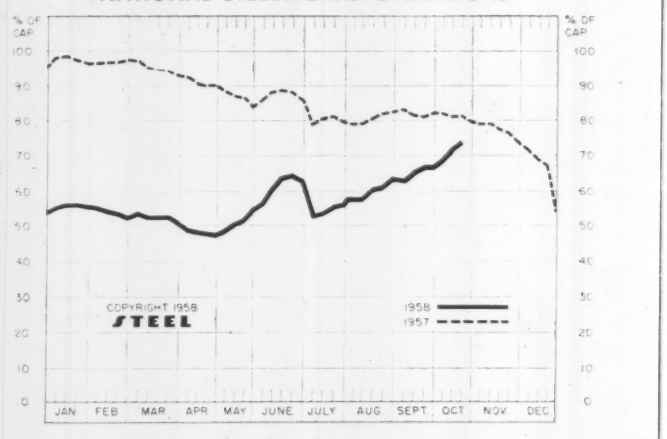
	Week Ended Oct. 19	Change	Same Week 1957	Same Week 1956
Pittsburgh	68.5	+ 1.5*	80	100
Chicago	84.5	+ 0.5*	84	101
Eastern	70	+ 2	82.5	101
Youngstown	64	+ 9	67	101
Wheeling	82	0	76	102.5
Cleveland	80	+ 5.5*	88.5	104
Buffalo	78	+ 20	97.5	107.5
Birmingham	66	+ 0.5	73.5	95.5
Cincinnati	79	+ 5.0*	86	93
St. Louis	97.5	+ 3.5*	94.5	103
Detroit	81.5	+ 3.5	99.5	101
Western	75	0	92	104
National Rate	74	+ 2.5	81	101.5

INGOT PRODUCTION‡

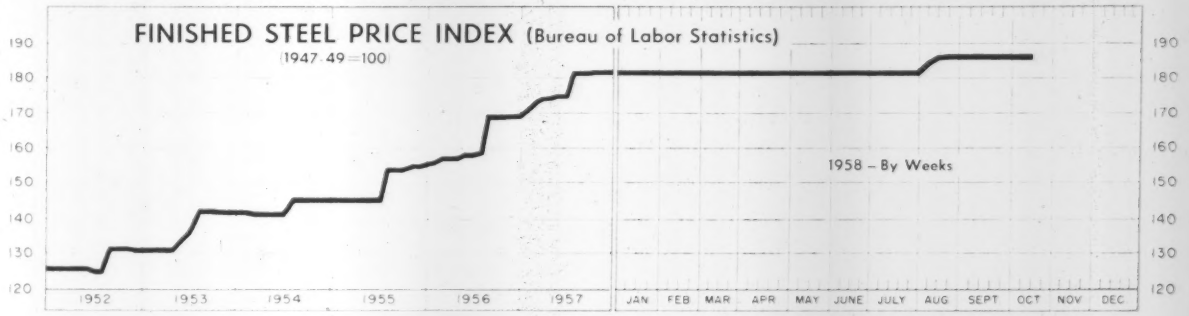
	Week Ended Oct. 19	Week Ago	Month Ago	Year Ago
INDEX (1947-49=100)	123.7†	120.3	110.2	128.9
NET TONS (In thousands)	1,987†	1,933	1,771	2,070

*Change from preceding week's revised rate. †Estimated. ‡American Iron & Steel Institute. Weekly capacity (net tons): 2,699,173 in 1958; 2,559,490 in 1957; 2,461,893 in 1956.

NATIONAL STEELWORKS OPERATIONS



Price Indexes and Composites



Oct. 14, 1958	Week Ago	Month Ago	Sept. Avg	Year Ago
186.7	186.7	186.6	186.6	181.7

AVERAGE PRICES OF STEEL (Bureau of Labor Statistics)

Week Ended Oct. 14

Prices include mill base prices and typical extras and deductions. Units are 100 lb except where otherwise noted in parentheses. For complete description of the following products and extras and deductions applicable to them, write to STEEL.

Rails, Standard No. 1	$5.825	Bars, Reinforcing	6.385
Rails, Light, 40 lb	7.292	Bars, C.F., Carbon	10.710
Tie Plates	6.875	Bars, C.F., Alloy	14.125
Axles, Railway	10.175	Bars, C.F., Stainless, 302 (lb)	0.553
Wheels, Freight Car, 33 in. (per wheel)	62.000	Sheets, H.R., Carbon	6.350
Plates, Carbon	6.350	Sheets, C.R., Carbon	7.300
Structural Shapes	6.167	Sheets, Galvanized	8.615
Bars, Tool Steel, Carbon (lb)	0.560	Sheets, C.R., Stainless, 302 (lb)	0.688
Bars, Tool Steel, Alloy, Oil Hardening Die (lb)	0.680	Sheets, Electrical	12.625
Bars, Tool Steel, H.R., Alloy, High Speed, W 6.75, Cr 4.5, V 2.1, Mo 5.5, C 0.060 (lb)	1.400	Strip, C.R., Carbon	9.489
Bars, Tool Steel, H.R., Alloy, High Speed, W18, Cr 4, V 1 (lb)	1.895	Strip, C.R., Stainless, 430 (lb)	0.493
Bars, H.R., Alloy	10.775	Strip, H.R., Carbon	6.250
Bars, H.R., Stainless, 303 (lb)	0.525	Pipe, Black, Buttweld (100 ft)	20.525
Bars, H.R., Carbon	6.675	Pipe, Galv., Buttweld (100 ft)	23.975
		Pipe, Line (100 ft)	205.710
		Casing, Oil Well, Carbon (100 ft)	201.080
		Casing, Oil Well, Alloy (100 ft)	315.213
		Tubes, Boiler (100 ft)	51.200
		Tubing, Mechanical, Carbon (100 ft)	26.157
		Tubing, Mechanical, Stainless, 304 (100 ft)	205.608
		Tin Plate, Hot-dipped, 1.25 lb (95 lb base box)	9.783
		Tin Plate, Electrolytic, 0.25 lb (95 lb base box)	8.483
		Black Plate, Canmaking Quality (95 lb base box)	7.583
		Wire, Drawn, Carbon	10.575
		Wire, Drawn, Stainless, 430 (lb)	0.653
		Bale Ties (bundles)	7.967
		Nails, Wire, 8d Common	9.828
		Wire, Barbed (80-rod spool)	8.719
		Woven Wire Fence (20-rod roll)	21.737

STEEL's FINISHED STEEL PRICE INDEX*

	Oct. 15 1958	Week Ago	Month Ago	Year Ago	5 Yr Ago
Index (1935-39 avg=100)	246.65	246.65	246.65	239.15	189.38
Index in cents per lb	6.682	6.682	6.682	6.479	5.130

STEEL's ARITHMETICAL PRICE COMPOSITES*

Finished Steel, NT	$149.28	$149.28	$149.28	$146.03	$115.54
No. 2 Fdry Pig Iron, GT	66.49	66.49	66.49	66.49	56.54
Basic Pig Iron, GT	65.99	65.99	65.99	65.99	56.04
Malleable Pig Iron, GT	67.27	67.27	67.27	67.27	57.27
Steelmaking Scrap, GT	42.33	42.33	43.00	37.83	32.50

*For explanation of weighted index see STEEL, Sept. 19, 1949, p. 54; of arithmetical price composite, STEEL, Sept. 1, 1952, p. 130.

Comparison of Prices

Comparative prices by districts in cents per pound except as otherwise noted. Delivered prices based on nearest production point.

FINISHED STEEL	Oct. 15 1958	Week Ago	Month Ago	Year Ago	5 Yr Ago
Bars, H.R., Pittsburgh	5.675	5.675	5.675	5.425	4.15
Bars, H.R., Chicago	5.675	5.675	5.675	5.425	4.15
Bars, H.R., deld. Philadelphia	5.975	5.975	5.975	5.725	5.302
Bars, C.F., Pittsburgh	7.65*	7.65*	7.65*	7.30*	5.20
Shapes, Std., Pittsburgh	5.50	5.50	5.50	5.275	4.10
Shapes, Std., Chicago	5.50	5.50	5.50	5.275	4.10
Shapes, deld., Philadelphia	5.77	5.77	5.77	5.545	4.38
Plates, Pittsburgh	5.30	5.30	5.30	5.10	4.10
Plates, Chicago	5.30	5.30	5.30	5.10	4.10
Plates, Coatesville, Pa.	5.30	5.30	5.30	5.10	4.35
Plates, Sparrows Point, Md.	5.30	5.30	5.30	5.10	4.10
Plates, Claymont, Del.	5.30	5.30	5.30	5.70	4.55
Sheets, H.R., Pittsburgh	5.10	5.10	5.10	4.925	3.925
Sheets, H.R., Chicago	5.10	5.10	5.10	4.925	3.925
Sheets, C.R., Pittsburgh	6.275	6.275	6.275	6.05	4.775
Sheets, C.R., Chicago	6.275	6.275	6.275	6.05	4.775
Sheets, C.R., Detroit	6.275	6.275	6.275	6.05-6.15	4.975
Sheets, Galv., Pittsburgh	6.875	6.875	6.875	6.60	5.275
Strip, H.R., Pittsburgh	5.10	5.10	5.10	4.925	3.975-4.425
Strip, H.R., Chicago	5.10	5.10	5.10	4.925	3.925
Strip, C.R., Pittsburgh	7.425	7.425	7.425	7.15	5.45-5.95
Strip, C.R., Chicago	7.425	7.425	7.425	7.15	5.70
Strip, C.R., Detroit	7.425	7.425	7.425	7.25	5.45-6.05
Wire, Basic, Pittsburgh	8.00	8.00	8.00	7.65	5.475-5.525
Nails, Wire, Pittsburgh	8.95	8.95	8.95	8.95	6.35-6.55
Tin plate (1.50 lb) box, Pitts.	$10.30	$10.30	$10.30	$10.30	$8.95

*Including 0.35c for special quality.

SEMIFINISHED STEEL					
Billets, forging, Pitts. (NT)	$99.50	$99.50	$99.50	$96.00	$75.50
Wire rods $\frac{7}{32}$-$\frac{9}{16}$" Pitts.	6.40	6.40	6.40	6.15	4.525

PIG IRON, Gross Ton	Oct. 15 1958	Week Ago	Month Ago	Year Ago	5 Yr Ago
Bessemer, Pitts.	$67.00	$67.00	$67.00	$67.00	$57.00
Basic, Valley	66.00	66.00	66.00	66.00	56.00
Basic, deld., Phila.	70.41	70.41	70.41	70.01	60.75
No. 2 Fdry, Neville Island, Pa.	66.50	66.50	66.50	66.50	56.50
No. 2 Fdry, Chicago	66.50	66.50	66.50	66.50	56.50
No. 2 Fdry, deld., Phila.	70.91	70.91	70.91	70.51	61.25
No. 2 Fdry, Birm.	62.50	62.50	62.50	62.50	52.88
No. 2 Fdry (Birm.) deld. Cin	70.20	70.20	70.20	70.20	60.43
Malleable, Valley	66.50	66.50	66.50	66.50	56.50
Malleable, Chicago	66.50	66.50	66.50	66.50	56.50
Ferromanganese, net ton†	245.00	245.00	245.00	245.00	200.00

†74-76% Mn, Duquesne, Pa.

SCRAP, Gross Ton (Including broker's commission)					
No. 1 Heavy Melt, Pittsburgh	$43.50	$43.50	$43.50	$38.50	$36.50
No. 1 Heavy Melt, E. Pa.	41.00	42.00	40.00	37.50	31.50
No. 1 Heavy Melt, Chicago	42.50	41.50	45.50	37.50	29.50
No. 1 Heavy Melt, Valley	43.50	43.50	43.50	36.50	34.50
No. 1 Heavy Melt, Cleve.	40.00	40.00	40.00	34.50	31.50
No. 1 Heavy Melt, Buffalo	35.50	35.50	34.50	38.50	33.50
Rails, Rerolling, Chicago	62.50	63.50	65.50	55.50	42.50
No. 1 Cast, Chicago	45.50	43.50	46.50	38.50	32.50

COKE, Net Ton					
Beehive, Furn., Connlsvl.	$15.25	$15.25	$15.25	$15.25	$14.75
Beehive, Fdry., Connlsvl.	18.25	18.25	18.25	18.25	16.75
Oven, Fdry., Milwaukee	30.50	30.50	30.50	30.50	25.25

Steel Prices

Mill prices as reported to STEEL, Oct. 15, cents per pound except as otherwise noted. *Changes shown in italics.* Code number following mill points indicates producing company. Key to producers, page 305; footnotes, page 307.

SEMIFINISHED

INGOTS, Carbon, Forging (NT)

Munhall,Pa. U5 ..... $76.00

INGOTS, Alloy (NT)

Detroit S41 ..... $82.00
Economy,Pa. B14 ..... 82.00
Farrell,Pa. S3 ..... 82.00
Lowellville,O. S3 ..... 82.00
Midland,Pa. C18 ..... 82.00
Munhall,Pa. U5 ..... 82.00
Sharon,Pa. S3 ..... 82.00

BILLETS, BLOOMS & SLABS Carbon,Rerolling (NT)

Bartonville,Ill. K4 ..... $82.00
Bessemer,Pa. U5 ..... 80.00
Buffalo R2 ..... 80.00
Clairton,Pa. U5 ..... 80.00
Ensley,Ala. T2 ..... 80.00
Fairfield,Ala. T2 ..... 80.00
Fontana,Calif. K1 ..... 99.50
Gary,Ind. U5 ..... 80.00
Johnstown,Pa. B3 ..... 80.00
Lackawanna,N.Y. B2 ..... 80.00
Munhall,Pa. U5 ..... 80.00
Owensboro,Ky. G8 ..... 77.50
S.Chicago,Ill. R2, U5 ..... 80.00
S.Duquesne,Pa. U5 ..... 80.00
Sterling,Ill. N15 ..... 80.00
Youngstown R2 ..... 80.00

Carbon, Forging (NT)

Bessemer,Pa. N5 ..... $99.50
Buffalo R2 ..... 99.50
Canton,O. R2 ..... 102.00
Clairton,Pa. U5 ..... 99.50
Conshohocken,Pa. A3 ..... 104.50
Ensley,Ala. T2 ..... 99.50
Fairfield,Ala. T2 ..... 99.50
Farrell,Pa. S3 ..... 99.50
Fontana,Calif. K1 ..... 109.00
Gary,Ind. U5 ..... 99.50
Geneva,Utah C11 ..... 99.50
Houston S5 ..... 104.50
Johnstown,Pa. B2 ..... 99.50
Lackawanna,N.Y. B2 ..... 99.50
LosAngeles B3 ..... 109.00
Midland,Pa. C18 ..... 99.50
Munhall,Pa. U5 ..... 99.50
Owensboro,Ky. C8 ..... 96.00
Seattle B3 ..... 113.00
Sharon,Pa. S3 ..... 99.50
S.Chicago R2, U5, W14 99.50
S.Duquesne,Pa. U5 ..... 99.50
S.SanFrancisco B3 ..... 109.00
Warren,O. C17 ..... 99.50

Alloy, Forging (NT)

Bethlehem,Pa. R2 ..... $119.00
Bridgeport,Conn. C32 ..... 119.00
Buffalo R2 ..... 119.00
Canton,O. R2, T7 ..... 119.00
Conshohocken,Pa. A3 ..... 126.00
Detroit S41 ..... 119.00
Economy,Pa. B14 ..... 119.00
Farrell,Pa. S3 ..... 119.00
Fontana,Calif. K1 ..... 140.00
Gary,Ind. U5 ..... 119.00
Houston S5 ..... 124.00
Ind.Harbor,Ind. Y1 ..... 119.00
Johnstown,Pa. B2 ..... 119.00
Lackawanna,N.Y. B2 ..... 119.00
LosAngeles B3 ..... 139.00
Owensboro,Ky. G8 ..... 114.00
Lowellville,O. S3 ..... 119.00
Massillon,O. R2 ..... 119.00
Midland,Pa. C18 ..... 119.00
Munhall,Pa. U5 ..... 119.00
Sharon,Pa. S3 ..... 119.00
S.Chicago R2,U5,W14 ..... 119.00
S.Duquesne,Pa. U5 ..... 119.00
Struthers,O. Y1 ..... 119.00
Warren,O. C17 ..... 119.00

ROUNDS, SEAMLESS TUBE (NT)

Buffalo R2 ..... $122.50
Canton,O. R2 ..... 125.00
Cleveland R2 ..... 122.50
Gary,Ind. U5 ..... 122.50
S.Chicago,Ill. R2, W14 122.50
S.Duquesne,Pa. U5 ..... 122.50
Warren,O. C17 ..... 122.50

SKELP

Aliquippa,Pa. J5 ..... 5.05
Munhall,Pa. U5 ..... 5.05
Pittsburgh J5 ..... 5.05
Warren,O. R2 ..... 5.05
Youngstown R2, U5 ..... 5.05

WIRE RODS

AlabamaCity,Ala. R2 ..... 6.40
Aliquippa,Pa. J5 ..... 6.40
Alton,Ill. L1 ..... 6.60
Bartonville,Ill. K4 ..... 6.50
Buffalo W12 ..... 6.40
Cleveland A7 ..... 6.40
Donora,Pa. A7 ..... 6.40
Fairfield,Ala. T2 ..... 6.40
Houston S5 ..... 6.65
IndianaHarbor,Ind. Y1 ..... 6.40
Johnstown,Pa. B2 ..... 6.40
Joliet,Ill. A7 ..... 6.40
KansasCity,Mo. S5 ..... 6.65
Kokomo,Ind. C16 ..... 6.50
LosAngeles B3 ..... 7.20
Minnequa,Colo. C10 ..... 6.65
Monessen,Pa. P7 ..... 6.40
N.Tonawanda,N.Y. B11 ..... 6.40
Pittsburg,Calif. C11 ..... 7.20
Portsmouth,O. P12 ..... 6.40
Roebling,N.J. R5 ..... 6.50
S.Chicago,Ill. R2, W14 ..... 6.40
SparrowsPoint,Md. B2 ..... 6.50
Sterling,Ill.(1) N15 ..... 6.40
Sterling,Ill. N15 ..... 6.50
Struthers,O. Y1 ..... 6.40
Worcester,Mass. A7 ..... 6.70

STRUCTURALS

Carbon Steel Std. Shapes

AlabamaCity,Ala. R2 ..... 5.50
Atlanta A11 ..... 5.70
Aliquippa,Pa. J5 ..... 5.50
Bessemer,Ala. T2 ..... 5.50
Bethlehem,Pa. B2 ..... 5.55
Birmingham C15 ..... 5.50
Clairton,Pa. U5 ..... 5.50
Fairfield,Ala. T2 ..... 5.50
Fontana,Calif. K1 ..... 6.30
Gary,Ind. U5 ..... 5.50
Geneva,Utah C11 ..... 5.50
Houston S5 ..... 5.60
Ind.Harbor,Ind. I-2, Y1 ..... 5.50
Johnstown,Pa. B2 ..... 5.55
Joliet,Ill. P22 ..... 5.50
KansasCity,Mo. S5 ..... 5.60
Lackawanna,N.Y. B2 ..... 5.55
LosAngeles B3 ..... 6.20
Minnequa,Colo. C10 ..... 5.80
Munhall,Pa. U5 ..... 5.50
Niles,Calif. P1 ..... 6.25
Phoenixville,Pa. P4 ..... 5.55
Portland,Oreg. O4 ..... 6.25
Seattle B3 ..... 6.25
S.Chicago,Ill. U5, W14 ..... 5.50
S.SanFrancisco B3 ..... 6.15
Sterling,Ill. N15 ..... 5.50
Torrance,Calif. C11 ..... 6.20
Weirton,W.Va. W6 ..... 5.50

Wide Flange

Bethlehem,Pa. B2 ..... 5.55
Clairton,Pa. U5 ..... 5.50
Fontana,Calif. K1 ..... 6.45
IndianaHarbor,Ind. I-2 ..... 5.50
Lackawanna,N.Y. B2 ..... 5.55
Munhall,Pa. U5 ..... 5.50
Phoenixville,Pa. P4 ..... 5.55
S.Chicago,Ill. U5 ..... 5.50
Weirton,W.Va. W6 ..... 5.50

Alloy Std. Shapes

Aliquippa,Pa. J5 ..... 6.80
Clairton,Pa. U5 ..... 6.80
Gary,Ind. U5 ..... 6.80
Houston S5 ..... 6.90
Munhall,Pa. U5 ..... 6.80
S.Chicago,Ill. U5, W14 ..... 6.80

H.S., L.A. Std. Shapes

Aliquippa,Pa. J5 ..... 8.05
Bessemer,Ala. T2 ..... 8.05
Bethlehem,Pa. B2 ..... 8.10
Clairton,Pa. U5 ..... 8.05
Fairfield,Ala. T2 ..... 8.05
Fontana,Calif. K1 ..... 8.85
Gary,Ind. U5 ..... 8.05
Geneva,Utah C11 ..... 8.05
Houston S5 ..... 8.15
Ind.Harbor,Ind. I-2, Y1 ..... 8.05
Johnstown,Pa. B2 ..... 8.10
KansasCity,Mo. S5 ..... 8.15
Lackawanna,N.Y. B2 ..... 8.10
LosAngeles B3 ..... 8.75
Munhall,Pa. U5 ..... 8.05
Seattle B3 ..... 8.80
S.Chicago,Ill. U5, W14 ..... 8.05
S.SanFrancisco B3 ..... 8.70
Struthers,O. Y1 ..... 8.05

H.S., L.A. Wide Flange

Bethlehem,Pa. B2 ..... 8.10
Ind.Harbor,Ind. I-2 ..... 8.05
Lackawanna,N.Y. B2 ..... 8.10
Munhall,Pa. U5 ..... 8.05
S.Chicago,Ill. U5 ..... 8.05

PILING

BEARING PILES

Bethlehem,Pa. B2 ..... 5.55
Ind.Harbor,Ind. I-2 ..... 5.50
Lackawanna,N.Y. B2 ..... 5.55
Munhall,Pa. U5 ..... 5.50
S.Chicago,Ill. I-2, U5 ..... 5.50

STEEL SHEET PILING

Ind.Harbor,Ind. I-2 ..... 6.50
Lackawanna,N.Y. B2 ..... 6.50
Munhall,Pa. U5 ..... 6.50
S.Chicago,Ill. I-2, U5 ..... 6.50
Weirton,W.Va. W6 ..... 6.50

PLATES

PLATES, Carbon Steel

AlabamaCity,Ala. R2 ..... 5.30
Aliquippa,Pa. J5 ..... 5.30
Ashland,Ky.(15) A10 ..... 5.30
Atlanta A11 ..... 5.50
Bessemer,Ala. T2 ..... 5.30
Clairton,Pa. U5 ..... 5.30
Claymont,Del. C22 ..... 5.30
Cleveland J5, R2 ..... 5.30
Coatesville,Pa. L7 ..... 5.30
Conshohocken,Pa. A3 ..... 5.30
Ecorse,Mich. G5 ..... 5.30
Fairfield,Ala. T2 ..... 5.30
Farrell,Pa. S3 ..... 5.30
Fontana,Calif.(30) K1 ..... 6.10
Gary,Ind. U5 ..... 5.30
Geneva,Utah C11 ..... 5.30
GraniteCity,Ill. G4 ..... 5.40
Harrisburg,Pa. P4 ..... 5.30
Houston S5 ..... 5.40
Ind.Harbor,Ind. I-2, Y1 ..... 5.30
Johnstown,Pa. B2 ..... 5.30
Lackawanna,N.Y. B2 ..... 5.30
Mansfield,O. E6 ..... 5.30
Minnequa,Colo. C10 ..... 6.15
Munhall,Pa. U5 ..... 5.30
Newport,Ky. A2 ..... 5.30
Pittsburgh J5 ..... 5.30
Riverdale,Ill. A1 ..... 5.30
Seattle B3 ..... 6.20
Sharon,Pa. S3 ..... 5.30
S.Chicago,Ill. U5, W14 ..... 5.30
SparrowsPoint,Md. B2 ..... 5.30
Sterling,Ill. N15 ..... 5.30
Steubenville,O. W10 ..... 5.30
Warren,O. R2 ..... 5.30
Youngstown U5, Y1 ..... 5.30
Youngstown(27) R2 ..... 5.30

PLATES, Carbon Abras. Resist.

Claymont,Del. C22 ..... 6.75
Fontana,Calif. K1 ..... 7.85
Geneva,Utah C11 ..... 7.05
Houston S5 ..... 7.15
Johnstown,Pa. B2 ..... 7.05
SparrowsPoint,Md. B2 ..... 7.05

PLATES, Wrought Iron

Economy,Pa. B14 ..... 13.15

PLATES, H.S., L.A.

Aliquippa,Pa. J5 ..... 7.95
Ashland,Ky. A10 ..... 7.95
Bessemer,Ala. T2 ..... 7.95
Clairton,Pa. U5 ..... 7.95
Claymont,Del. C22 ..... 7.95
Cleveland J5, R2 ..... 7.95
Coatesville,Pa. L7 ..... 7.95
Conshohocken,Pa. A3 ..... 7.95
Economy,Pa. B14 ..... 7.95
Ecorse,Mich. G5 ..... 7.95
Fairfield,Ala. T2 ..... 7.95
Farrell,Pa. S3 ..... 7.95
Fontana,Calif.(30) K1 ..... 8.75
Gary,Ind. U5 ..... 7.95
Geneva,Utah C11 ..... 7.95
Houston S5 ..... 8.05
Ind.Harbor,Ind. I-2, Y1 ..... 7.95
Johnstown,Pa. B2 ..... 7.95
Munhall,Pa. U5 ..... 7.95
Pittsburgh J5 ..... 7.95
Seattle B3 ..... 8.85
Sharon,Pa. S3 ..... 7.95
S.Chicago,Ill. U5, W14 ..... 7.95
SparrowsPoint,Md. B2 ..... 7.95
Warren,O. R2 ..... 7.95
Youngstown U5, Y1 ..... 7.95

PLATES, ALLOY

Aliquippa,Pa. J5 ..... 7.50
Claymont,Del. C22 ..... 7.50
Coatesville,Pa. L17 ..... 7.50
Economy,Pa. B14 ..... 7.50
Farrell,Pa. S3 ..... 7.50
Fontana,Calif. K1 ..... 8.30
Gary,Ind. U5 ..... 7.50
Houston S5 ..... 7.60
Ind.Harbor,Ind. Y1 ..... 7.50
Johnstown,Pa. B2 ..... 7.50
Lowellville,O. S3 ..... 7.50
Munhall,Pa. U5 ..... 7.50
Newport,Ky. A2 ..... 7.50
Pittsburgh J5 ..... 7.50
Seattle B3 ..... 8.40
Sharon,Pa. S3 ..... 7.50
S.Chicago,Ill. U5, W14 ..... 7.50
SparrowsPoint,Md. B2 ..... 7.50
Youngstown Y1 ..... 7.50

FLOOR PLATES

Cleveland J5 ..... 6.375
Conshohocken,Pa. A3 ..... 6.375
Ind.Harbor,Ind. I-2 ..... 6.375
Munhall,Pa. U5 ..... 6.375
Pittsburgh J5 ..... 6.375
S.Chicago,Ill. U5 ..... 6.375

PLATES, Ingot Iron

Ashland c.l.(15) A10 ..... 5.55
Ashland l.c.l.(15) A10 ..... 6.05
Cleveland c.l. R2 ..... 6.05
Warren,O. c.l. R2 ..... 6.05

BARS

BARS, Hot-Rolled Carbon (Merchant Quality)

Ala.City,Ala.(9) R2 ..... 5.675
Aliquippa,Pa.(9) J5 ..... 5.675
Alton,Ill. L1 ..... 5.875
Atlanta(9) A11 ..... 5.875
Bessemer,Ala.(9) T2 ..... 5.675
Birmingham(9) C15 ..... 5.675
Buffalo(9) R2 ..... 5.675
Canton,O.(23) R2 ..... 6.15
Clairton,Pa.(9) U5 ..... 5.675
Cleveland(9) R2 ..... 5.675
Ecorse,Mich.(9) G5 ..... 5.675
Emeryville,Calif. J7 ..... 6.425
Fairfield,Ala.(9) T2 ..... 5.675
Fairless,Pa.(9) U5 ..... 5.825
Fontana,Calif.(9) K1 ..... 6.375
Gary,Ind.(9) U5 ..... 5.675
Houston(9) S5 ..... 5.925
Ind.Harbor (9) I-2, Y1 ..... 5.675
Johnstown,Pa.(9) B2 ..... 5.675
Joliet,Ill. P22 ..... 5.675
KansasCity,Mo. (9) S5 ..... 5.925
Lackawanna(9) B2 ..... 5.675
LosAngeles(9) B3 ..... 6.375
Massillon,O.(23) R2 ..... 6.15
Midland,Pa.(23) C18 ..... 6.025
Milton,Pa. M18 ..... 5.825
Minnequa,Colo. C10 ..... 6.125
Niles,Calif. P1 ..... 6.375
N.T'wanda,N.Y.(23) B11 ..... 6.025
Owensboro,Ky.(9) G8 ..... 5.425
Pittsburg,Calif.(9) C11 ..... 6.375
Pittsburgh(9) J5 ..... 5.675
Portland,Oreg. O4 ..... 6.425
Riverdale,Ill.(9) A1 ..... 5.675
Seattle B3, N14 ..... 6.425
S Ch'c'go(9)R2,U5,W14 ..... 5.675
S.Duquesne,Pa.(9) U5 ..... 5.675
S.SanFran.,Calif.(9) B3 ..... 6.425
Sterling,Ill.(1)(9) N15 ..... 5.675
Sterling,Ill.(9) N15 ..... 5.775
Struthers,O.(9) Y1 ..... 5.675
Tonawanda,N.Y. B12 ..... 5.675
Torrance,Calif.(9) C11 ..... 6.375
Warren,O. C17 ..... 6.025
Youngstown(9) R2, U5 ..... 5.675

BARS, Hot-Rolled Alloy

Aliquippa,Pa. J5 ..... 6.725
Bethlehem,Pa. B2 ..... 6.725
Bridgeport,Conn. C32 ..... 6.80
Buffalo R2 ..... 6.725
Canton,O. R2, T7 ..... 6.725
Clairton,Pa. U5 ..... 6.725
Detroit S41 ..... 6.725
Economy,Pa. B14 ..... 6.725
Ecorse,Mich. G5 ..... 6.725
Fairless,Pa. U5 ..... 6.875
Farrell,Pa. S3 ..... 6.725
Fontana,Calif. K1 ..... 7.775
Gary,Ind. U5 ..... 6.725
Houston S5 ..... 6.875
Ind.Harbor,Ind. I-2, Y1 ..... 6.725
Johnstown,Pa. B2 ..... 6.725
KansasCity,Mo. S5 ..... 6.875
Lackawanna,N.Y. B2 ..... 6.725
Lowellville,O. S3 ..... 6.725
LosAngeles B3 ..... 7.775
Massillon,O. R2 ..... 6.725
Midland,Pa. C18 ..... 6.725
Owensboro,Ky. G8 ..... 6.475
Pittsburgh J5 ..... 6.725
Sharon,Pa. S3 ..... 6.725
S.Chicago R2, U5, W14 ..... 6.725
S.Duquesne,Pa. U5 ..... 6.725
Struthers,O. Y1 ..... 6.725
Warren,O. C17 ..... 6.725
Youngstown U5 ..... 6.725

BARS & SMALL SHAPES, H.R. High-Strength, Low-Alloy

Aliquippa,Pa. J5 ..... 8.30
Bessemer,Ala. T2 ..... 8.30
Bethlehem,Pa. B2 ..... 8.30
Clairton,Pa. U5 ..... 8.30
Cleveland R2 ..... 8.30
Ecorse,Mich. G5 ..... 8.30
Fairfield,Ala. T2 ..... 8.30
Fontana,Calif. K1 ..... 9.00
Gary,Ind. U5 ..... 8.30
Houston S5 ..... 8.55
Ind.Harbor,Ind. Y1 ..... 8.30
Johnstown,Pa. B2 ..... 8.30
KansasCity,Mo. S5 ..... 8.55
Lackawanna,N.Y. B2 ..... 8.30
LosAngeles B3 ..... 9.00
Pittsburgh J5 ..... 8.30
Seattle B3 ..... 9.05
S.Chicago,Ill. R2, W14 ..... 8.30
S.Duquesne,Pa. U5 ..... 8.30
S.SanFrancisco B3 ..... 9.05
Struthers,O. Y1 ..... 8.30
Youngstown U5 ..... 8.30

BAR SIZE ANGLES; H.R. Carbon

Bethlehem,Pa.(9) B2 ..... 5.825
Houston(9) S5 ..... 5.925
KansasCity,Mo.(9) S5 ..... 5.925
Lackawanna(9) B2 ..... 5.675
Sterling,Ill. N15 ..... 5.775
Sterling,Ill.(1) N15 ..... 5.675
Tonawanda,N.Y. B12 ..... 5.675

BAR SIZE ANGLES; S. Shapes

Aliquippa,Pa. J5 ..... 5.675
Atlanta A11 ..... 5.875
Joliet,Ill. P22 ..... 5.675
Minnequa,Colo. C10 ..... 6.125
Niles,Calif. P1 ..... 6.375
Pittsburgh J5 ..... 5.675
Portland,Oreg. O4 ..... 6.425
SanFrancisco S7 ..... 6.52
Seattle B3 ..... 6.425

BAR SHAPES, Hot-Rolled Alloy

Aliquippa,Pa. J5 ..... 6.80
Clairton,Pa. U5 ..... 6.80
Gary,Ind. U5 ..... 6.80
Houston S5 ..... 7.05
KansasCity,Mo. S5 ..... 7.05
Pittsburgh J5 ..... 6.80
Youngstown U5 ..... 6.80

BARS, C.F. Leaded (Including leaded extra)

Carbon

LosAngeles P2, S30 ..... 11.75*

Alloy

Ambridge,Pa. W18 ..... 10.175
BeaverFalls,Pa. M12 ..... 10.175
Camden,N.J. P13 ..... 10.35
Chicago W18 ..... 10.175
Elyria,O. W8 ..... 10.175
Monaca,Pa. S17 ..... 10.175
Newark,N.J. W18 ..... 10.35
SpringCity,Pa. K3 ..... 10.35

*Grade A; add 0.050c for Grade B.

BARS, Cold-Finished Carbon

Ambridge,Pa. W18 ..... 7.65
BeaverFalls,Pa. M12,R2 ..... 7.65
Birmingham C15 ..... 8.25
Buffalo B5 ..... 7.70
Camden,N.J. P13 ..... 8.10
Carnegie,Pa. C12 ..... 7.65
Chicago W18 ..... 7.65
Cleveland A7, C20 ..... 7.65
Detroit B5, P17 ..... 7.85
Detroit S11 ..... 7.65
Donora,Pa. A7 ..... 7.65
Elyria,O. W8 ..... 7.65
FranklinPark,Ill. N5 ..... 7.65
Gary,Ind. R2 ..... 7.65
GreenBay,Wis. F7 ..... 7.65
Hammond,Ind. J5, L2 ..... 7.65
Hartford,Conn. R2 ..... 8.15
Harvey,Ill. B5 ..... 7.65
LosAngeles(49) S30 ..... 9.10
LosAngeles(49) P2, R2 ..... 9.10
Mansfield,Mass. R2 ..... 8.20
Massillon,O. R2, R8 ..... 7.65
Midland,Pa. C18 ..... 7.65
Monaca,Pa. S17 ..... 7.65
Newark,N.J. W18 ..... 8.10
NewCastle,Pa.(17) B4 ..... 7.65
Pittsburgh J5 ..... 7.65
Plymouth,Mich. P5 ..... 7.90
Putnam,Conn. W18 ..... 8.20
Readville,Mass. C14 ..... 8.20
S.Chicago,Ill. W14 ..... 7.65
SpringCity,Pa. K3 ..... 8.10
Struthers,O. Y1 ..... 7.65
Warren,O. C17 ..... 7.65
Willimantic,Conn. J5 ..... 8.15
Waukegan,Ill. A7 ..... 7.65
Youngstown F3, Y1 ..... 7.65

BARS, Cold-Finished Carbon (Turned and Ground)

Cumberland,Md.(5) C19 ..... 6.55

BARS, Cold-Finished Alloy

Ambridge,Pa. W18 ..... 9.025
BeaverFalls,Pa. M12,R2 ..... 9.025
Bethlehem,Pa. B2 ..... 9.025
Bridgeport,Conn. C32 ..... 9.175
Buffalo B5 ..... 9.025
Camden,N.J. P13 ..... 9.20
Canton,O. T7 ..... 9.025
Carnegie,Pa. C12 ..... 9.025
Chicago W18 ..... 9.025
Cleveland A7, C20 ..... 9.025
Detroit B5, P17 ..... 9.225
Detroit S41 ..... 9.025
Donora,Pa. A7 ..... 9.025
Elyria,O. W8 ..... 9.025
FranklinPark,Ill. N5 ..... 9.025
Gary,Ind. R2 ..... 9.025
GreenBay,Wis. F7 ..... 9.025
Hammond,Ind. J5, L2 ..... 9.025
Hartford,Conn. R2 ..... 9.325
Harvey,Ill. B5 ..... 9.025
Lackawanna,N.Y. B2 ..... 9.025
LosAngeles P2, S30 ..... 11.00
Mansfield,Mass. B5 ..... 9.325
Massillon,O. R2, R8 ..... 9.025
Midland,Pa. C18 ..... 9.025
Monaca,Pa. S17 ..... 9.025
Newark,N.J. W18 ..... 9.20
Plymouth,Mich. P5 ..... 9.225
S.Chicago,Ill. W14 ..... 9.025
SpringCity,Pa. K3 ..... 9.20
Struthers,O. Y1 ..... 9.025
Warren,O. C17 ..... 9.025
Waukegan,Ill. A7 ..... 9.025
Willimantic,Conn. J5 ..... 9.325
Worcester,Mass. A7 ..... 9.325
Youngstown F3, Y1 ..... 9.025

BARS, Reinforcing (To Fabricators)

AlabamaCity,Ala. R2 ..5.675
Atlanta A11 .....5.675
Birmingham C15 .....5.675
Buffalo R2 .....5.675
Cleveland R2 .....5.675
Ecorse,Mich. G5 .....5.675
Emeryville,Calif. J7 ...6.425
Fairfield,Ala. T2 ....5.675
Fairless,Pa. U5 .....5.825
Fontana,Calif. K1 .....6.375
Ft.Worth,Tex.(4)(26)T4 6.125
Gary,Ind. U5 .....5.675
Houston S5 .....5.925
Ind.Harbor,Ind. I-2, Y1 5.675
Johnstown,Pa. B2 ....5.675
Joliet,Ill. P22 .....5.675
KansasCity,Mo. S5 ....5.925
Kokomo,Ind. C16 .....5.775
Lackawanna,N.Y. B2 ..5.675
LosAngeles B3 .....6.375
Madison,Ill. L1 .....5.875
Milton,Pa. M18 .....5.825
Minnequa,Colo. C10 ...6.125
Niles,Calif. P1 .....6.375
Pittsburg,Calif. C11 ..6.375
Pittsburgh J5 .....5.675
Portland,Oreg. O4 ....6.425
SandSprings,Okla. S5 ..5.925
Seattle B3, N14 .....6.425
S.Chicago,Ill. R2, W14 5.675
S.Duquesne,Pa. U5 ....5.675
S.SanFrancisco B3 ....6.425
SparrowsPoint,Md. B2..5.675
Sterling,Ill.(1) N15 ....5.675
Sterling,Ill. N15 .....5.775
Struthers,O. Y1 .....5.675
Tonawanda,N.Y. B12 ...6.10
Torrance,Calif. C11 ..6.375
Youngstown R2, U5 ..5.675

BARS, Reinforcing (Fabricated; to Consumers)

Baltimore B2 .....7.42
Boston B2, U8 .....8.15
Chicago U8 .....7.41
Cleveland U8 .....7.39
Houston S5 .....7.60
Johnstown,Pa. B2 .....7.33
KansasCity,Mo. S5 ....7.60
Lackawanna,N.Y. B2 ..7.35
Marion,O. P11 .....6.70
Newark,N.J. U8 .....7.80
Philadelphia U8 .....7.63
Pittsburgh J5, U8 .....7.35
SandSprings,Okla. S5 ....7.60
Seattle B3, N14 .....7.95
SparrowsPt.,Md. B2 ...7.33
St.Paul U8 .....8.17
Williamsport,Pa. S19 ...7.25

BARS, Wrought Iron

Economy,Pa.(S.R.)B14 14.45
Economy,Pa.(D.R.)B14 18.00
Economy(Staybolt)B14 18.45

RAIL STEEL BARS

ChicagoHts.(3) C2, I-2, 5.575
ChicagoHts.(4)(44) I-2, 5.675
ChicagoHts.(4) C2 ....5.675
Franklin,Pa.(3) F5 ....5.575
Franklin,Pa.(4) F5 ....5.675
JerseyShore,Pa.(3) J8 ..5.55
Marion,O.(3) P11 .....5.575
Tonawanda(3) B12 ....5.575
Tonawanda(4) B12 ....6.10

SHEETS

SHEETS, Hot-Rolled Steel (18 Gage and Heavier)

AlabamaCity,Ala. R2 ..5.10
Allenport,Pa. P7 .....5.10
Aliquippa,Pa. J5 .....5.10
Ashland,Ky.(8) A10 ....5.10
Cleveland J5, R2 .....5.10
Conshohocken,Pa. A3 ..5.15
Detroit(8) M1 .....5.10
Ecorse,Mich. G5 .....5.10
Fairfield,Ala. T2 .....5.10
Fairless,Pa. U5 .....5.15
Farrell,Pa. S3 .....5.10
Fontana,Calif. K1 ....5.825
Gary,Ind. U5 .....5.10
Geneva,Utah C11 .....5.20
GraniteCity,Ill.(8) G4 ..5.20
Ind.Harbor,Ind. I-2, Y1 5.10
Irvin,Pa. U5 .....5.10
Lackawanna,N.Y. B2 ..5.10
Mansfield,O. E6 .....5.10
Munhall,Pa. U5 .....5.10
Newport,Ky. A2 .....5.10
Niles,O. M21, S3 .....5.10
Pittsburg,Calif. C11 ..5.80
Pittsburgh J5 .....5.10
Portsmouth,O. P12 ....5.10
Riverdale,Ill. A1 .....5.10
Sharon,Pa. S3 .....5.10
S.Chicago,Ill. U5, W14 ..5.10
SparrowsPoint,Md. B2 ..5.10
Steubenville,O. W10 ...5.10
Warren,O. R2 .....5.10
Weirton,W.Va. W6 ....5.10
Youngstown U5, Y1 ...5.10

SHEETS, H.R. (19 Ga. & Lighter)

Niles,O. M21 .....6.275

SHEETS, H.R. Alloy

Gary,Ind. U5 .....8.40
Ind.Harbor,Ind. Y1 ....8.40
Irvin,Pa. U5 .....8.40
Munhall,Pa. U5 .....8.40
Newport,Ky. A2 .....8.40
Youngstown U5, Y1 ....8.40

SHEETS, H.R. (14 Ga. & Heavier) High-Strength, Low-Alloy

Aliquippa,Pa. J5 .....7.525
Ashland,Ky. A10 .....7.525
Cleveland J5, R2 .....7.525
Conshohocken,Pa. A3 ..7.575
Ecorse,Mich. G5 .....7.525
Fairfield,Ala. T2 .....7.525
Fairless,Pa. U5 .....7.575
Farrell,Pa. S3 .....7.525
Fontana,Calif. K1 .....8.25
Gary,Ind. U5 .....7.525
Ind.Harbor,Ind. I-2, Y1 7.525
Irvin,Pa. U5 .....7.525
Lackawanna(35) B2 ..7.525
Munhall,Pa. U5 .....7.525
Pittsburgh J5 .....7.525
S.Chicago,Ill. U5, W14 7.525
Sharon,Pa. S3 .....7.525
SparrowsPoint(36) B2..7.525
Warren,O. R2 .....7.525
Weirton,W.Va. W6 ....7.525
Youngstown U5, Y1 ..7.525

SHEETS, Hot-Rolled Ingot Iron (18 Gage and Heavier)

Ashland,Ky.(8) A10 ....5.35
Cleveland R2 .....5.875
Warren,O. R2 .....5.875

SHEETS, Cold-Rolled Ingot Iron

Cleveland R2 .....7.05
Middletown,O. A10 ...6.775
Warren,O. R2 .....7.05

SHEETS, Cold-Rolled Steel (Commercial Quality)

AlabamaCity,Ala. R2 ..6.275
Allenport,Pa. P7 .....6.275
Aliquippa,Pa. J5 .....6.275
Cleveland J5, R2 .....6.275
Conshohocken,Pa. A3 ..6.325
Detroit M1 .....6.275
Ecorse,Mich. G5 .....6.275
Fairfield,Ala. T2 .....6.275
Fairless,Pa. U5 .....6.325
Follansbee,W.Va. F4 ..6.275
Fontana,Calif. K1 .....7.40
Gary,Ind. U5 .....6.275
GraniteCity,Ill. G4 ....6.375
Ind.Harbor,Ind. I-2, Y1 6.275
Irvin,Pa. U5 .....6.275
Lackawanna,N.Y. B2 ..6.275
Mansfield,O. E6 .....6.275
Middletown,O. A10 ....6.275
Newport,Ky. A2 .....6.275
Pittsburg,Calif. C11 ..7.225
Pittsburgh J5 .....6.275
Portsmouth,O. P12 ....6.275
SparrowsPoint,Md. B2..6.275
Steubenville,O. W10 ...6.275
Warren,O. R2 .....6.275
Weirton,W.Va. W6 ....6.275
Yorkville,O. W10 .....6.275
Youngstown Y1 .....6.275

SHEETS, Cold-Rolled, High-Strength, Low-Alloy

Aliquippa,Pa. J5 .....9.275
Cleveland J5, R2 .....9.275
Ecorse,Mich. G5 .....9.275
Fairless,Pa. U5 .....9.325
Fontana,Calif. K1 .....10.40
Gary,Ind. U5 .....9.275
Ind.Harbor,Ind. I-2,Y1 9.275
Irvin,Pa. U5 .....9.275
Lackawanna(37) B2 ..9.275
Pittsburgh J5 .....9.275
SparrowsPoint(38) B2..9.275
Warren,O. R2 .....9.275
Weirton,W.Va. W6 ....9.275
Youngstown Y1 .....9.275

SHEETS, Culvert

	Cu Steel	Cu Fe
Ala.City,Ala. R2	7.225	....
Ashland,Ky. A10	7.225	7.475
Canton,O. R2	7.225	7.75
Fairfield T2	7.225	7.475
Gary,Ind. U5	7.225	7.475
GraniteCity,Ill.G4	7.325	....
Ind.Harbor I-2	7.225	7.475
Irvin,Pa. U5	7.225	7.475
Kokomo,Ind. C16	7.325	....
MartinsFry. W10	7.225	7.475
Pitts.,Calif. C11	7.975	....
SparrowsPt. B2	7.225	....
Pittsburgh J5	7.225	....

SHEETS, Culvert—Pure Iron

Ind.Harbor,Ind. I-2 ...7.475

SHEETS, Galvanized Steel Hot-Dipped

AlabamaCity,Ala. R2 ,6.875‡
Ashland,Ky. A10 ....6.875†
Canton,O. R2 .....6.875‡
Dover,O. E6 .....6.875†
Fairfield,Ala. T2 ....6.875†
Gary,Ind. U5 .....6.875†
GraniteCity,Ill. G4 ....6.975•
Ind.Harbor,Ind. I-2 ..6.875†
Irvin,Pa. U5 .....6.875†
Kokomo,Ind. C16 ....6.975‡
MartinsFerry,O. W10 ,6.875•
Middletown,O. A10 ..6.875†
Pittsburg,Calif. C11 ...7.625•
Pittsburgh J5 .....6.875†
SparrowsPt.,Md. B2 ..6.875†
Warren,O. R2 .....6.875†
Weirton,W.Va. W6 ....6.875•

•Continuous and noncontinuous. †Continuous. ‡Noncontinuous.

SHEETS, Well Casing

Fontana,Calif. K1 .....7.325

SHEETS, Galvanized High-Strength, Low-Alloy

Irvin,Pa. U5 .....10.025
SparrowsPt.(39) B2 ..10.025
Pittsburgh J5 .....10.125

SHEETS, Galvannealed Steel

Canton,O. R2 .....7.275
Irvin,Pa. U5 .....7.275

SHEETS, Galvanized Ingot Iron (Hot-Dipped Continuous)

Ashland,Ky. A10 .....7.125
Middletown,O. A10 ....7.12

SHEETS, Electrogalvanized

Cleveland(28) R2 .....7.65
Niles,O.(28) R2 .....7.65
Youngstown J5 .....7.50
Weirton,W.Va. W6 ....7.50

SHEETS, Aluminum Coated

Butler,Pa. A10 (type 1) 9.525
Butler,Pa. A10 (type 2) 9.625

SHEETS, Enameling Iron

Ashland,Ky. A10 .....6.775
Cleveland R2 .....6.775
Fairfield,Ala. T2 .....6.775
Gary,Ind. U5 .....6.775
GraniteCity,Ill. G4 ....6.875
Ind.Harbor,Ind. I-2,Y1 6.775
Irvin,Pa. U5 .....6.775
Middletown,O. A10 ....6.775
Niles,O. M21, S3 .....6.775
Youngstown Y1 .....6.775

BLUED STOCK, 29 Gage

Follansbee,W.Va. F4 ...8.70
Ind.Harbor,Ind. I-2 ....8.70
Mansfield,O. E6 .....8.70
Warren,O. R2 .....8.70
Yorkville,O. W10 .....8.70

SHEETS, Long Terne, Steel (Commercial Quality)

BeechBottom,W.Va.W10 7.225
Gary,Ind. U5 .....7.225
Mansfield,O. E6 .....7.225
Middletown,O. A10 ....7.225
Niles,O. M21, S3 .....7.225
Warren,O. R2 .....7.225
Weirton,W.Va. W6 ....7.225

SHEETS, Long Terne, Ingot Iron

Middletown,O. A10 ....7.625

Key To Producers

A1 Acme Steel Co.
A2 Acme-Newport Steel Co.
A3 Alan Wood Steel Co.
A4 Allegheny Ludlum Steel
A5 Alloy Metal Wire Div., H. K. Porter Co. Inc.
A6 American Shim Steel Co.
A7 American Steel & Wire Div., U. S. Steel Corp.
A8 Anchor Drawn Steel Co.
A9 Angell Nail & Chaplet
A10 Armco Steel Corp.
A11 Atlantic Steel Co.

B1 Babcock & Wilcox Co.
B2 Bethlehem Steel Co.
B3 Beth. Pac. Coast Steel
B4 Blair Strip Steel Co.
B5 Bliss & Laughlin Inc.
B8 Braeburn Alloy Steel
B9 Brainard Steel Div., Sharon Steel Corp.
B10 E. & G. Brooke, Wickwire Spencer Steel Div., Colo. Fuel & Iron
B11 Buffalo Bolt Co., Div., Buffalo Eclipse Corp.
B12 Buffalo Steel Corp.
B14 A. M. Byers Co.
B15 J. Bishop & Co.

C1 Calstrip Steel Corp.
C2 Calumet Steel Div., Borg-Warner Corp.
C4 Carpenter Steel Co.
C9 Colonial Steel Co.
C10 Colorado Fuel & Iron
C11 Columbia-Geneva Steel
C12 Columbia Steel & Shaft.
C13 Columbia Tool Steel Co.
C14 Compressed Steel Shaft.
C15 Connors Steel Div., H. K. Porter Co. Inc.
C16 Continental Steel Corp.
C17 Copperweld Steel Co.
C18 Crucible Steel Co.
C19 Cumberland Steel Co.
C20 Cuyahoga Steel & Wire
C22 Claymont Plant, Wickwire Spencer Steel Div., Colo. Fuel & Iron
C23 Charter Wire Inc.
C24 G. O. Carlson Inc.
C32 Carpenter Steel of N.Eng.

D2 Detroit Steel Corp.
D3 Dearborn Div., Sharon Steel Corp.
D4 Disston Div., H. K Porter Co. Inc.
D6 Driver-Harris Co.
D7 Dickson Weatherproof Nail Co.
D8 Damascus Tube Co.
D9 Wilbur B. Driver Co.

E1 Eastern Gas & Fuel Assoc.
E2 Eastern Stainless Steel
E4 Electro Metallurgical Co.
E5 Elliott Bros. Steel Co.
E6 Empire-Reeves Steel Corp.
E10 Enamel Prod. & Plating

F2 Firth Sterling Inc.
F3 Fitzsimmons Steel Co.
F4 Follansbee Steel Corp.
F5 Franklin Steel Div., Borg-Warner Corp.
F6 Fretz-Moon Tube Co.
F7 Ft. Howard Steel & Wire
F8 Ft. Wayne Metals Inc.

G4 Granite City Steel Co.
G5 Great Lakes Steel Corp.
G6 Greer Steel Co.
G8 Green River Steel Corp.

H1 Hanna Furnace Corp.
H7 Helical Tube Co.

I-1 Igoe Bros. Inc.
I-2 Inland Steel Co.
I-3 Interlake Iron Corp.
I-4 Ingersoll Steel Div., Borg-Warner Corp.
I-6 Ivins Steel Tube Works
I-7 Indiana Steel & Wire Co.

J1 Jackson Iron & Steel Co.
J3 Jessop Steel Co.
J4 Johnson Steel & Wire Co.
J5 Jones & Laughlin Steel
J6 Joslyn Mfg. & Supply
J7 Judson Steel Corp.
J8 Jersey Shore Steel Co.

K1 Kaiser Steel Corp.
K2 Keokuk Electro-Metals
K3 Keystone Drawn Steel
K4 Keystone Steel & Wire
K7 Kenmore Metals Corp.

L1 Laclede Steel Co.
L2 LaSalle Steel Co.
L3 Latrobe Steel Co.
L6 Lone Star Steel Co.
L7 Lukens Steel Co.
L8 Leschen Wire Rope Div., H. K. Porter Co. Inc.

M1 McLouth Steel Corp.
M4 Mahoning Valley Steel
M6 Mercer Pipe Div., Sawhill Tubular Products
M8 Mid-States Steel & Wire
M12 Moltrup Steel Products
M14 McInnes Steel Co.
M16 Mt. Pine & Special. Wire
M17 Metal Forming Corp.
M18 Milton Steel Div., Merritt-Chapman&Scott
M21 Mallory-Sharon Metals Corp.
M22 Mill Strip Products Co.

N1 National-Standard Co.
N2 National Supply Co.
N3 National Tube Div., U. S. Steel Corp.
N5 Nelsen Steel & Wire Co.
N6 New England High Carbon Wire Co.
N8 Newman-Crosby Steel
N14 Northwest. Steel Rolling Mills Inc.
N15 Northwestern S.&W. Co.
N20 Neville Ferro Alloy Co.

O4 Oregon Steel Mills

P1 Pacific States Steel Corp.
P2 Pacific Tube Co.
P4 Phoenix Iron & Steel Co., Sub. of Barium Steel Corp.
P5 Pilgrim Drawn Steel
P6 Pittsburgh Coke & Chem.
P7 Pittsburgh Steel Co.
P11 Pollak Steel Co.
P12 Portsmouth Div., Detroit Steel Corp.
P13 Precision Drawn Steel
P14 Pitts. Screw & Bolt Co.
P15 Pittsburgh Metallurgical
P16 Page Steel & Wire Div., American Chain & Cable
P17 Plymouth Steel Corp.
P19 Pitts. Rolling Mills
P20 Prod. Steel Strip Corp.
P22 Phoenix Mfg. Co.
P24 Phil. Steel & Wire Corp.

R2 Republic Steel Corp.
R3 Rhode Island Steel Corp.
R5 Roebling's Sons, John A.
R6 Rome Strip Steel Co.
R8 Reliance Div., Eaton Mfg.
R9 Rome Mfg. Co.
R10 Rodney Metals Inc.

S1 Seneca Wire & Mfg. Co.
S3 Sharon Steel Corp.
S4 Sharon Tube Co.
S5 Sheffield Div., Armco Steel Corp.
S6 Shenango Furnace Co.
S7 Simmons Co.
S8 Simonds Saw & Steel Co.
S12 Spencer Wire Corp.
S13 Standard Forgings Corp.
S14 Standard Tube Co.
S15 Stanley Works
S17 Superior Drawn Steel Co.
S18 Superior Steel Div., Copperweld Steel Co.
S19 Sweet's Steel Co.
S20 Southern States Steel
S23 Superior Tube Co.
S25 Stainless Welded Prod.
S26 Specialty Wire Co.Inc.
S30 Sierra Drawn Steel Corp.
S40 Seneca Steel Service
S41 Stainless & Strip Div., J&L Steel Corp.
S42 Southern Elec. Steel Co.

T2 Tenn. Coal & Iron Div.,
T4 Texas Steel Co.
U. S. Steel Corp.
T3 Tenn. Products & Chemical Corp.
T5 Thomas Strip Div., Pittsburgh Steel Co.
T6 Thompson Wire Co.
T7 Timken Roller Bearing
T9 Tonawanda Iron Div., Am. Rad. & Stan. San.
T13 Tube Methods Inc.
T19 Techalloy Co. Inc.

U3 Union Wire Rope Corp.
U4 Universal-Cyclops Steel
U5 United States Steel Corp.
U6 U. S. Pipe & Foundry
U7 Ulbrich Stainless Steels
U8 U. S. Steel Supply Div., U. S. Steel Corp.

V2 Vanadium-Alloys Steel
V3 Vulcan-Kidd Steel Div., H. K. Porter Co.

W1 Wallace Barnes Steel Div., Associated Spring Corp.
W2 Wallingford Steel Co.
W3 Washburn Wire Co.
W4 Washington Steel Corp.
W6 Weirton Steel Co.
W8 Western Automatic Machine Screw Co.
W9 Wheatland Tube Co.
W10 Wheeling Steel Corp.
W12 Wickwire Spencer Steel Div., Colo. Fuel & Iron
W13 Wilson Steel & Wire Co.
W14 Wisconsin Steel Div., International Harvester
W15 Woodward Iron Co.
W18 Wyckoff Steel Co.

Y1 Youngstown Sheet & Tube

STRIP

STRIP, Hot-Rolled Carbon

Ala.City,Ala.(27) R2 ..5.10
Alliance,Pa. P7 .....5.10
Alton,Ill. L1 .....5.30
Ashland,Ky.(8) A10 ....5.10
Atlanta A11 .....5.10
Bessemer,Ala. T2 .....5.10
Birmingham C15 .....5.10
Buffalo(27) R2 .....5.10
Conshohocken,Pa. A3 ..5.15
Detroit M1 .....5.10
Ecorse,Mich. G5 .....5.10
Fairfield,Ala. T2 .....5.10
Farrell,Pa. S3 .....5.10
Fontana,Calif. K1 ...5.825
Gary,Ind. U5 .....5.10
Ind.Harbor,Ind. I-2, Y1 .5.10
Johnstown,Pa.(25) B2 ..5.10
Lackawanna,N.Y.(25) B2.5.10
LosAngeles(25) B3 ....5.85
LosAngeles C1 .....8.60
Minnequa,Colo. C10 ....6.20
Riverdale,Ill. A1 .....5.10
SanFrancisco S7 .....6.60
Seattle(25) B3 .....6.10
Seattle N14 .....6.60
Sharon,Pa. S3 .....5.10
S.Chicago W14 .....5.10
S.SanFrancisco(25) B3 .5.85
SparrowsPoint,Md. B2 ..5.10
Torrance,Calif. C11 ....5.85
Warren,O. R2 .....5.10
Weirton,W.Va. W6 ....5.10
Youngstown U5 .....5.10

STRIP, Hot-Rolled Alloy

Carnegie,Pa. S18 .....8.10
Farrell,Pa. S3 .....8.40
Gary,Ind. U5 .....8.40
Houston S5 .....8.65
Ind.Harbor,Ind. Y1 ....8.40
KansasCity,Mo. S5 ....8.65
LosAngeles B3 .....9.60
Lowellville,O. S3 .....8.40
Newport,Ky. A2 .....8.40
Sharon,Pa. A2, S3 ....8.40
S.Chicago,Ill. W14 ....8.40
Youngstown U5, Y1 ....8.40

STRIP, Hot-Rolled High-Strength, Low-Alloy

Ashland,Ky. A10 ....7.575
Bessemer,Ala. T2 ....7.575
Conshohocken,Pa. A3 ..7.575
Ecorse,Mich. G5 ....7.575
Fairfield,Ala. T2 ....7.575
Farrell,Pa. S3 .....7.575
Gary,Ind. U5 .....7.575
Ind.Harbor,Ind. I-2,Y1 7.575
Lackawanna,N.Y. B2 ..7.575
LosAngeles(25) B3 ...8.325
Seattle(25) B3 .....8.575
Sharon,Pa. S3 .....7.575
S.Chicago,Ill. W14 ....7.575
S.SanFrancisco(25) B3 8.325
SparrowsPoint,Md. B2 .7.575
Warren,O. R2 .....7.575
Weirton,W.Va. W6 ....7.575
Youngstown U5, Y1 ...7.575

STRIP, Hot-Rolled Ingot Iron

Ashland,Ky.(8) A10 ..5.35
Warren,O. R2 .....5.875

STRIP, Cold-Rolled Carbon

Anderson,Ind. G6 .....7.425
Baltimore T6 .....7.425
Boston T6 .....7.975
Buffalo S40 .....7.425
Cleveland A7, J5 .....7.425
Dearborn,Mich. D3 ....7.425
Detroit D2, M1, P20 ..7.425
Dover,O. G6 .....7.425
Ecorse,Mich. G5 .....7.15
Evanston,Ill. M22 ....7.525
Farrell,Pa. S3 .....7.425
Follansbee,W.Va. F4 ..7.425
Fontana,Calif. K1 ....9.20
Franklin Park,Ill. T6 ..7.525
Ind.Harbor,Ind. Y1 ....7.425
Indianapolis S41 .....7.575
LosAngeles J5 .....9.325
LosAngeles C1 .....9.30
McKeesport,Pa. E10 ....7.525
NewBedford,Mass. R10.7.875
NewBritain,Conn. S15..7.875
NewCastle,Pa. B4, E5 .7.425
NewHaven,Conn. D2 ....7.875
NewKensington,Pa. A6 .7.425
Pawtucket,R.I. R3 ....7.975
Pawtucket,R.I. N8 ....7.975
Philadelphia P24 ....7.875
Pittsburgh J5 .....7.425
Riverdale,Ill. A1 .....7.525
Rome,N.Y.(32) R6 .....7.425
Sharon,Pa. S3 .....7.425
Trenton,N.J.(31) R5 ..8.875
Wallingford,Conn. W2..7.875
Warren,O. R2, T5 ....7.425
Worcester,Mass. A7 ...7.975
Youngstown S41, Y1 ..7.425

STRIP, Cold-Rolled Alloy

Boston T6 .....15.90
Carnegie,Pa. S18 ....15.05
Cleveland A7 .....15.05
Dover,O. G6 .....15.55
Farrell,Pa. S3 .....15.55
Franklin Park,Ill. T6 ..15.55
Harrison,N.J. C18 ....15.55
Indianapolis S41 ....15.70
Lowellville,O. S3 ....15.55
Pawtucket,R.I. N8 ....15.90
Riverdale,Ill. A1 ....15.55
Sharon,Pa. S3 .....15.55
Worcester,Mass. A7 ..15.35
Youngstown S41 .....15.55

STRIP, Cold-Rolled High-Strength, Low-Alloy

Cleveland A7 .....10.80
Dearborn,Mich. D3 ..10.80
Dover,O. G6 .....10.80
Ecorse,Mich. G5 .....10.50
Farrell,Pa. S3 .....10.80
Ind.Harbor,Ind. Y1 ....10.80
Sharon,Pa. S3 .....10.80
Warren,O. R2 .....10.80

STRIP, Cold-Finished Spring Steel (Annealed)

	0.26-0.40C	0.41-0.60C	0.61-0.80C	0.81-1.05C	1.06-1.35C
Baltimore T6	9.50	10.70	12.90	15.90	18.85
Boston T6	9.50	10.70	12.90	15.90	18.85
Bristol,Conn. W1	...	10.70	12.90	16.10	19.30
Carnegie,Pa. S18	8.95	10.40	12.60	15.60	....
Cleveland A7	8.95	10.40	12.60	15.60	18.55
Dearborn,Mich. D3	9.05	10.50	12.70	....	....
Detroit D2	9.05	10.50	12.70	15.70	....
Dover,O. G6	8.95	10.40	12.60	15.60	18.55
Evanston,Ill. M22	8.95	10.40	12.60	15.60	....
Farrell,Pa. S3	8.95	10.40	12.60	15.60	18.55
Fostoria,O. S1	10.05	10.40	12.60	15.60	....
Franklin Park,Ill. T6	9.05	10.40	12.60	15.60	18.55
Harrison,N.J. C18	...	....	12.90	16.10	19.30
Indianapolis J5	9.10	10.55	12.60	15.60	18.55
LosAngeles C1	11.15	12.60	14.80	17.80	....
LosAngeles J5	11.15	12.60	14.80	....	....
NewBritain,Conn. S15	9.40	10.70	12.90	15.90	18.85
NewCastle,Pa. B4, E5	8.95	10.40	12.60	15.60	....
NewHaven,Conn. D2	9.40	10.70	12.90	15.90	....
NewKensington,Pa. A6	8.95	10.40	12.60	15.60	....
New York W3	...	10.70	12.90	16.10	19.30
Pawtucket,R.I. N8	9.50	10.70	12.90	15.90	18.85
Riverdale,Ill. A1	9.05	10.40	12.60	15.60	18.55
Rome,N.Y.(32) R6	8.95	10.40	12.60	15.60	18.55
Sharon,Pa. S3	8.95	10.40	12.60	15.60	18.55
Trenton,N.J. R5	...	10.70	12.90	15.90	18.85
Wallingford Conn. W2	9.40	10.70	12.90	15.90	18.75
Warren,O. T5	8.95	10.40	12.60	15.60	18.55
Worcester,Mass. A7, T6..	9.50	10.70	12.90	15.90	18.85
Youngstown J5	8.95	10.40	12.60	15.60	18.55

Spring Steel (Tempered)

	Up to 0.80C	0.81-1.05C	1.06-1.35C
Bristol,Conn. W1	18.85	22.95	27.80
Buffalo W12	18.25	....	....
Fostoria,O. S1	19.05	22.15	....
Franklin Park,Ill. T6	19.20	23.30	28.15
Harrison,N.J. C18	18.85	22.95	27.80
New York W3	18.85	22.95	27.80
Palmer,Mass. W12	18.85	....	....
Trenton,N.J. R5	18.85	22.95	27.80
Worcester,Mass. A7, T6 ..	18.85	22.95	27.80
Youngstown J5	19.20	23.30	28.15

TIN MILL PRODUCTS

TIN PLATE, Electrolytic (Base Box)	0.25 lb	0.50 lb	0.75 lb
Aliquippa Pa. J5	$8.75	$9.00	$9.40
Fairfield,Ala. T2	8.85	9.10	9.50
Fairless,Pa. U5	8.85	9.10	9.50
Fontana,Calif. K1	9.50	9.75	10.15
Gary Ind. U5	8.75	9.00	9.40
GraniteCity,Ill. G4	8.85	9.10	9.50
IndianaHarbor,Ind. I-2, Y1	8.75	9.00	9.40
Irvin,Pa. U5	8.75	9.00	9.40
Niles,O. R2	8.75	9.00	9.40
Pittsburg,Calif. C11	9.50	9.75	10.15
SparrowsPoint,Md. B2	8.85	9.10	9.50
Yorkville,O. W10	8.75	9.00	9.40

ELECTROTIN (22-27 Gage; Dollars per 100 lb)			
Aliquippa,Pa. J5	7.725	7.925	....
Niles,O. R2	7.725	7.925	8.125

TIN PLATE, American	1.25 lb	1.50 lb
Aliquippa,Pa. J5	$10.05	$10.30
Fairfield,Ala. T2	10.15	10.40
Fairless,Pa. U5	10.15	10.40
Fontana,Calif. K1	10.80	11.05
Gary,Ind. U5	10.05	10.30
Ind.Harb Y1	10.05	10.30
Pitts.,Calif. C11	10.80	11.05
Sp Pt.,Md. B2	10.15	10.40
Weirton,W.Va. W6	10.05	10.30
Yorkville,O. W10	10.05	10.30

BLACK PLATE (Base Box)

Aliquippa,Pa. J5 .....$7.85
Fairfield,Ala. T2 .....7.95
Fairless,Pa. U5 .....7.95
Fontana,Calif. K1 .....8.60
Gary,Ind. U5 .....7.85
GraniteCity,Ill. G4 .....7.95
Ind.Harbor,Ind. I-2, Y1..7.85
Irvin,Pa. U5 .....7.85
Weirton,W.Va. W6 ....10.80
Youngstown Y1 .....10.80

STRIP, Cold-Rolled Ingot Iron

Warren,O. R2 .....8.175

STRIP, C.R. Electrogalvanized

Cleveland A7 .....7.425
Dover,O. G6 .....7.425*
Evanston,Ill. M22 ....7.525*
McKeesport,Pa. E10 ...7.50*
Riverdale,Ill. A1 ....7.525*
Warren,O. B9, S3, T5 .7.425*
Worcester,Mass. A7 ..7.975
Youngstown J5 .....7.425*

*Plus galvanizing extras.

STRIP, Galvanized (Continuous)

Farrell,Pa. S3 .....7.50
Sharon,Pa. S3 .....7.50

TIGHT COOPERAGE HOOP

Atlanta A11 .....5.65
Farrell,Pa. S3 .....5.525
Riverdale,Ill. A1 ....5.675
Sharon,Pa. S3 .....5.525
Youngstown U5 .....5.525

HOLLOWARE ENAMELING Black Plate (29 Gage)

Aliquippa,Pa. J5 .....7.50
Gary,Ind. U5 .....7.50
GraniteCity,Ill. G4 ....7.60
Ind.Harbor,Ind. Y1 ....7.50
Irvin Pa. U5 .....7.50
Yorkville,O. W10 .....7.50

MANUFACTURING TERNES (Special Coated, Base Box)

Gary,Ind. U5 .....$9.70
Irvin,Pa. U5 .....9.70

ROOFING SHORT TERNES (8 lb Coated, Base Box)

Gary,Ind. U5 .....$11.25

SILICON STEEL

C.R. COILS & CUT LENGTHS (22 Ga.)

Fully Processed (Semiprocessed ½c low-er)	Field	Armature	Electric	Motor	Dynamo
BeechBottom,W.Va. W10	....	11.70	12.40	13.55	14.65
Brackenridge,Pa. A4	....	....	12.40	13.55	14.65
GraniteCity,Ill. G4	9.975*	11.30*	12.00*	13.15*	....
IndianaHarbor,Ind. I-2	9.875*	11.20*	11.90*	13.05*	....
Mansfield,O. E6	9.875*	11.70	12.40	13.55	14.65
Newport,Ky. A2	9.875	11.70*	12.40*	13.55*	14.65*
Niles,O. M21	9.875*	11.70	12.40	13.55	....
Vandergrift,Pa. U5	9.875*	11.70	12.40	13.55	14.65
Warren,O. R2	9.875*	11.70	12.40	13.55	14.65
Zanesville,O. A10	....	11.70†	12.40	13.55	14.65

	Stator
Vandergrift,Pa. U5	8.10
Mansfield,O. E6	8.10

SHEETS (22 Ga., coils & cut lengths)

Fully Processed (Semiprocessed ½c lower)	T-72	T-65	T-58	T-52
BeechBottom,W.Va. W10	15.70	16.30	16.80	17.85
Vandergrift,Pa. U5	15.70	16.30	16.80	17.85
Zanesville,O. A10	15.70	16.30	16.80	17.85

C.R. COILS & CUT LENGTHS (22 Ga.)

	Grain Oriented T-100	T-90	T-80	T-73	T-66	T-72
Brackenridge,Pa. A4	....	18.10	19.70	20.20	20.70	15.70††
Butler,Pa. A10	....	....	19.70	20.20	20.70	....
Vandergrift,Pa. U5	17.10	18.10	19.70	20.20	20.70	15.70
Warren,O. R2	....	....	....	....	....	15.70‡

*Semiprocessed. †Fully processed only. ‡Coils, annealed, semiprocessed ½c lower. ††Coils only.

WIRE

WIRE, Manufacturers Bright, Low Carbon

Alabama City,Ala. R2 ..8.00
Aliquippa,Pa. J5 .....8.00
Alton,Ill. L1 .....8.20
Atlanta A1 .....8.00
Bartonville,Ill. K4 ....8.10
Buffalo W12 .....8.00
Chicago W13 .....8.00
Cleveland A7, C20 ....8.00
Crawfordsville,Ind. M8..8.10
Donora,Pa. A7 .....8.00
Duluth A7 .....8.00
Fairfield,Ala. T2 .....8.00
Fostoria,O.(24) S1 ....8.10
Houston S5 .....8.25
Jacksonville, Fla. M8 ..8.35
Johnstown,Pa. B2 ....8.00
Joliet,Ill. A7 .....8.00
KansasCity,Mo. S5 ....8.25
LosAngeles B3 .....10.70
Kokomo,Ind. C16 .....8.10
LosAngeles B3 .....8.95
Minnequa,Colo. C10 ....8.25
Monessen,Pa. P7, P16 ..8.00
N.Tonawanda,N.Y. B11 .8.00
Palmer,Mass. W12 ....8.30
Pittsburg,Calif. C11 ....8.95
Portsmouth,O. P12 ....8.00
Rankin,Pa. A7 .....8.00
S.Chicago,Ill. R2 .....8.00
S.SanFrancisco C10 ....8.95
SparrowsPoint,Md. B2 ..8.10
Sterling,Ill.(1) N15 ....8.00
Sterling,Ill. N15 .....8.10
Struthers,O. Y1 .....8.00
Waukegan,Ill. A7 .....8.00
Worcester,Mass. A7 ....8.30

WIRE, Cold Heading Carbon

Elyria,O. W8 .....8.00

WIRE, Gal'd., for ACSR

Bartonville,Ill. K4 ....12.65
Buffalo W12 .....13.40
Cleveland A7 .....12.65
Donora,Pa. A7 .....12.65
Duluth A7 .....12.65
Johnstown,Pa. B2 ....13.40
Minnequa,Colo. C10 ...12.775
Monessen,Pa. P16 ....12.65
Monessen,Pa. P7 .....13.40
Muncie,Ind. I-7 .....13.60
NewHaven,Conn. A7 ...12.95
Palmer,Mass. W12 ....13.70
Pittsburg,Calif. C11 ....13.45
Portsmouth,O. P12 ....12.65
Roebling,N.J. R5 .....12.95
SparrowsPt.,Md. B2 ...13.50
Struthers,O. Y1 .....13.40
Trenton,N.J. A7 .....12.95
Waukegan,Ill. A7 .....12.65
Worcester,Mass. A7 ...12.95

WIRE, Upholstery Spring

Aliquippa,Pa. J5 .....9.75
Alton,Ill. L1 .....9.95
Buffalo W12 .....9.75
Cleveland A7 .....9.75
Donora,Pa. A7 .....9.75
Duluth A7 .....9.75
Johnstown,Pa. B2 ....9.75
KansasCity,Mo. S5 ....10.00
LosAngeles B3 .....10.70
Minnequa,Colo. C10 ....9.95
Monessen,Pa. P7, P16 ..9.75
NewHaven,Conn. A7 ...10.05
Palmer,Mass. W12 ....10.05
Pittsburg,Calif. C11 ..10.25
Portsmouth,O. P12 ....9.75
Roebling,N.J. R5 .....10.05
S.Chicago,Ill. R2 .....9.75
S.SanFrancisco C10 ....10.70
SparrowsPt.,Md. B2 ...9.85
Struthers,O. Y1 .....9.75
Trenton,N.J. A7 .....10.05
Waukegan,Ill. A7 .....9.75
Worcester,Mass. A7 ...10.05

WIRE, MB Spring, High-Carbon

Aliquippa,Pa. J5 .....9.75
Alton,Ill. L1 .....9.95
Bartonville,Ill. K4 ....9.85
Buffalo W12 .....9.75
Cleveland A7 .....9.75
Donora,Pa. A7 .....9.75
Duluth A7 .....9.75
Fostoria,O. S1 .....9.80
Johnstown,Pa. B2 ....9.75
KansasCity,Mo. S5 ....10.00
LosAngeles B3 .....10.70
Milbury,Mass.(12) N6 .10.05
Minnequa,Colo. C10 ....9.95
Monessen,Pa. P7, P16 ..9.75
Muncie,Ind. I-7 .....9.95
Palmer,Mass. W12 ....10.05
Pittsburg,Calif. C11 ....10.70
Portsmouth,O. P12 ....9.75
Roebling,N.J. R5 .....10.05
S.Chicago,Ill. R2 .....9.75
S.SanFrancisco C10 ....10.70
SparrowsPt.,Md. B2 ...9.85
Struthers,O. Y1 .....9.75
Trenton,N.J. A7 .....10.05
Waukegan,Ill. A7 .....9.75
Worcester,Mass. A7, J4, T6 10.05

WIRE, Fine & Weaving(8" Coils)

Alton,Ill. L1 .....16.50
Bartonville Ill. K4 ...16.40
Chicago W13 .....16.30
Cleveland A7 .....16.30
Crawfordsville,Ind. M8 16.40
Fostoria,O. S1 .....16.30
Houston S5 .....15.85
Jacksonville,Fla. M8 ..16.65
Johnstown Pa. B2 .....16.30
KansasCity,Mo. S5 ....15.85
Kokomo,Ind. C16 .....16.30
Minnequa,Colo. C10 ....16.35
Monessen,Pa. P16 .....15.60
Muncie,Ind. I-7 .....16.50
Palmer,Mass. W12 .....16.60
S.SanFrancisco C10 ....17.15
Waukegan,Ill. A7 .....16.30
Worcester,Mass. A7, J6.16.60

WIRE, Tire Bead

Bartonville Ill. K4 ....17.15
Monessen,Pa. P16 ....16.55
Roebling,N.J. R5 .....17.65

ROPE WIRE (A)

Bartonville,Ill. K4 ....13.45
Buffalo W12 .....13.45
Fostoria,O. S1 .....13.45
Johnstown,Pa. R2 .....13.45
Monessen,Pa. P7 .....13.45
Muncie,Ind. I-7 .....13.65
Palmer,Mass. W12 .....13.75
Portsmouth,O. P12 ....13.45
Roebling,N.J. R5 .....13.75
St.Louis L8 .....12.75
SparrowsPt.,Md. B2 ...13.55
Struthers,O. Y1 .....13.45
Worcester,Mass. J4 ....13.75

(A) Plow and Mild Plow; add 0.25c for Improved Plow

WIRE, Cold-Rolled Flat

Anderson,Ind. G6	12.35
Baltimore T6	12.65
Boston T6	12.65
Buffalo W12	11.65
Chicago W13	12.45
Cleveland A7	12.35
Crawfordsville,Ind. M8	11.65
Dover,O. G6	12.35
Farrell,Pa. S3	11.65
Fostoria,O. S1	12.35
FranklinPark,Ill. T6	12.45
Kokomo,Ind. C16	12.35
Massillon,O. R8	12.35
Milwaukee C23	12.55
Monessen,Pa. P7, P16	11.65
Palmer,Mass. W12	11.95
Pawtucket,R.I. N8	11.95
Philadelphia P24	12.65
Riverdale,Ill. A1	12.45
Rome,N.Y. R6	12.35
Sharon,Pa. S3	11.65
Trenton,N.J. R5	12.65
Warren,O. R9	11.65
Worcester,Mass. A7,T6	12.65

NAILS, Stock

	Col.
AlabamaCity,Ala. R2	173
Aliquippa,Pa. J5	173
Atlanta A11	175
Bartonville,Ill. K4	175
Chicago W13	173
Cleveland A9	173
Crawfordsville,Ind. M8	175
Donora,Pa. A7	173
Duluth A7	173
Fairfield,Ala. T2	173
Houston S5	178
Jacksonville,Fla. M8	175
Johnstown,Pa. B2	173
Joliet,Ill. A7	173
KansasCity,Mo. S5	178
Kokomo,Ind. C16	175
Minnequa,Colo. C10	178
Monessen,Pa. P7	173
Pittsburg,Calif. C11	192
Rankin,Pa. A7	173
S.Chicago,Ill. R2	173
SparrowsPt., Md. B2	175
Sterling,Ill. (7) N15	175
Worcester,Mass. A7	179

(To Wholesalers; per cwt)

Galveston,Tex. D7	$9.10

NAILS, Cut (100 lb keg)
To Dealers (33)

Wheeling,W Va. W10	$9.80

POLISHED STAPLES

	Col.
AlabamaCity,Ala. R2	175
Aliquippa,Pa. J5	175
Atlanta A11	177
Bartonville,Ill. K4	177
Crawfordsville,Ind. M8	177
Donora,Pa. A7	175
Duluth A7	175
Fairfield,Ala. T2	175
Houston S5	180
Jacksonville,Fla. M8	177
Johnstown,Pa. B2	175
Joliet,Ill. A7	175
KansasCity,Mo. S5	180
Kokomo,Ind. C16	177
Minnequa,Colo. C10	180
Pittsburg,Calif. C11	194
Rankin,Pa. A7	175
S.Chicago,Ill. R2	175
SparrowsPt.,Md. B2	177
Sterling,Ill. (7) N15	175
Worcester,Mass. A7	181

TIE WIRE, Automatic Baler
(14½ Ga.) (per 97 lb Net Box)

	Coil No. 3150
AlabamaCity,Ala. R2	$10.26
Atlanta A11	10.36
Bartonville,Ill. K4	10.36
Buffalo W12	10.26
Chicago W13	10.26
Crawfordsville,Ind. M8	10.36
Donora,Pa. A7	10.26
Duluth A7	10.26
Fairfield,Ala. T2	10.26
Houston S5	10.51
Jacksonville,Fla. M8	10.36
Johnstown,Pa. B2	10.26
Joliet,Ill. A7	10.26
KansasCity,Mo. S5	10.51
Kokomo,Ind. C16	10.36
LosAngeles R3	11.05
Minnequa,Colo. C10	10.51
Pittsburg,Calif. C11	11.04
S.Chicago,Ill. R2	10.26
S.SanFrancisco C10	11.04
SparrowsPt.,Md. B2	10.36
Sterling,Ill. (37) N15	10.36

	Coil No. 6500 Stand.
AlabamaCity,Ala. R2	$10.60
Atlanta A11	10.70
Bartonville,Ill. K4	10.70
Buffalo W12	10.60
Chicago W13	10.60
Crawfordsville,Ind. M8	10.70
Donora,Pa. A7	10.60
Duluth A7	10.60
Fairfield,Ala. T2	10.60
Houston S5	10.85
Jacksonville,Fla. M8	10.70
Johnstown,Pa. B2	10.60
Joliet,Ill. A7	10.60
KansasCity,Mo. S5	10.85
Kokomo,Ind. C16	10.70
LosAngeles B3	11.40
Minnequa,Colo. C10	10.85
Pittsburg,Calif. C11	11.40
S.Chicago,Ill. R2	10.60
S.SanFrancisco C10	11.40
SparrowsPt.,Md. B2	10.70
Sterling,Ill.(37) N15	10.70

	Coil No. 6500 Interim
AlabamaCity,Ala. R2	$10.65
Atlanta A11	10.75
Bartonville,Ill. K4	10.75
Buffalo W12	10.65
Chicago W13	10.65
Crawfordsville,Ind. M8	10.75
Donora,Pa. A7	10.65
Duluth A7	10.65
Fairfield,Ala. T2	10.65
Houston S5	10.90
Jacksonville,Fla. M8	10.75
Johnstown,Pa. B2	10.65,
Joliet,Ill. A7	10.65
KansasCity,Mo. S5	10.90
Kokomo,Ind. C16	10.75
Los Angeles B3	11.45
Minnequa,Colo. C10	10.90
Pittsburg,Calif. C11	11.45
S.Chicago,Ill. R2	10.65
S.SanFrancisco C10	11.45
SparrowsPt.,Md. B2	10.75
Sterling,Ill.(37) N15	10.75

BALE TIES, Single Loop

	Col.
AlabamaCity,Ala. R2	212
Atlanta A11	214
Bartonville,Ill. K4	214
Crawfordsville,Ind. M8	214
Donora,Pa. A7	212
Duluth A7	212
Fairfield,Ala. T2	212
Houston S5	217
Jacksonville,Fla. M8	214
Joliet,Ill. A7	212
KansasCity,Mo. S5	217
Kokomo,Ind. C16	214
Minnequa,Colo. C10	217
Pittsburg,Calif. C11	236
S.SanFrancisco C10	236
SparrowsPt.,Md. B2	214
Sterling,Ill.(7) N15	214

FENCE POSTS

Birmingham C15	172
ChicagoHts.,Ill. C2, I-2	*177*
Duluth A7	172
Franklin,Pa. F5	*177*
Johnstown,Pa. B2	172
Marion,O. P11	172
Minnequa,Colo. C10	177
Sterling,Ill.(1) N15	172
Tonawanda,N.Y. B12	172

WIRE, Barbed

	Col.
AlabamaCity,Ala. R2	193••
Aliquippa,Pa. J5	190§
Atlanta A11	195§
Bartonville,Ill. K4	198
Crawfordsville,Ind. M8	198
Donora,Pa. A7	193†
Duluth A7	193†
Fairfield,Ala. T2	193†
Houston S5	198••
Jacksonville,Fla. M8	198
Johnstown,Pa. B2	196§
Joliet,Ill. A7	193†
KansasCity,Mo. S5	198••
Kokomo,Ind. C16	195†
Minnequa,Colo. C10	198••
Monessen,Pa. P7	196§
Pittsburg,Calif. C11	213†
Rankin,Pa. A7	193†
S.Chicago,Ill. R2	193••
S.SanFrancisco C10	212•
SparrowsPoint,Md. B2	198§
Sterling,Ill.(7) N15	198††

WOVEN FENCE, 9-15 Ga.

	Col.
Ala.City,Ala. R2	187••
Allq'ppa,Pa.9-11½ga.J5	190§
Atlanta A11	192§
Bartonville,Ill. K4	192
Crawfordsville,Ind. M8	192
Donora,Pa. A7	187†
Duluth A7	187†
Fairfield,Ala. T2	187†
Houston S5	192••
Jacksonville,Fla. M8	192
Johnstown,Pa.(43) B2	190§
Joliet,Ill. A7	187†
KansasCity,Mo. S5	192••
Kokomo,Ind. C16	189†
Minnequa,Colo. C10	192••
Pittsburg,Calif. C11	210†
Rankin,Pa. A7	187†
S.Chicago,Ill. R2	187••
Sterling,Ill.(7) N15	192††

	An'ld	Galv.
WIRE (16 gage) Stone	**Stone**	
Ala.City,Ala.R2	17.85	19.40••
Allq'ppa,Pa. J5.	17.15	18.95
Bartonville K4	17.95	19.75
Cleveland A7	17.85	....
Craw'dsville,MS.	17.95	19.65
Fostoria,O S1	18.35	19.90†
Houston S5	17.10	19.95••
Jacksonville MS.	17.95	19.65
Johnstown B2	17.85	19.65§
Kan.City,Mo. S5.	17.40	....
Kokomo C16	17.25	18.80†
Minnequa C10.	18.10	19.65••
P'im'r,Mass.W12	18.15	19.70†
Pitts.,Calif. C11	18.20	19.75†
S.SanFran C10	18.20	19.75••
SparrowsPt. B2.	17.95	19.75§
Sterling(37)N15	17.25	19.05††
Waukegan A7	17.85	19.40†
Worcester A7	18.15	....

WIRE, Merchant Quality

	An'ld	Galv.
(6 to 8 gage)	**An'ld**	
Ala.City,Ala.	R2	9.00 9.55••
Aliquippa	J5	8.65 9.325§
Atlanta(48)	A11	9.10 9.775§
Bartonville(48)	K4	9.10 9 775
Buffalo	W12	9.00 9.55†
Cleveland	A7	9.00 ....
Crawfordsville	M8	9.10 9.775
Donora,Pa.	A7	9.00 9.55†
Duluth	A7	9.00 9.55†
Fairfield	T2	9.00 9.55†
Houston(48)	S5	9.25 9.80••
Jacks'ville,Fla.	M8	9.10 9.775
Johnstown	B2(48)	9.00 9.675§
Joliet,Ill.	A7	9.00 9.55†
Kans.City(48)	S5	9.25 9.80••
Kokomo(48)	C16	9.10 9.65†
LosAngeles	B3	9.95 10.625§
Minnequa	C10	9.25 9.80••
Monessen	P7(48)	8.65 9.325§
Palmer,Mass.	W12	9.30 9.85†
Pitts.,Calif.	C11	9.95 10.50†
Rankin,Pa.	A7	9.00 9.55†
S.Chicago	R2	9.00 9.55••
S.SanFran	C10	9.95 10.50••
Spar'wsPt	B2(48)	9.10 9.775§
Sterling(48)	N15	9.25 9.925††
Sterling(1)	(48)	9.15 9.825††
Struthers,O.	Y1	9.00 9.65‡
Worcester,Mass.	A7	9.30 9.85†

Based on zinc price of: •13.50, +5c, $10c, ‡Less than 10c, ††10.50c, **Subject to zinc equalization extras.

FASTENERS

(Base discounts, shipments of one to four containers, per cent off list, f.o.b. mill)

BOLTS

Machine Bolts
Full Size Body (cut thread)
½ in. and smaller:

3 in. and shorter	53.0
3¼ in. thru 6 in.	47.0
Longer than 6 in.	33.0
⅝ in., 3 in. & shorter	44.0
3¼ in. thru 6 in.	37.0
Longer than 6 in.	27.0
⅝ in. thru 1 in:	
6 in. and shorter	33.0
Longer than 6 in.	27.0
1⅛ in. and larger:	
All lengths	27.0

Undersize Body (rolled thread)
½ in. and smaller:

3 in. and shorter	53.0
3¼ in. thru 6 in.	47.0

Machine Bolts, Hot Galvanized
(Square & Hex, Full & Undersize Body)
½ in. and smaller:

3 in. and shorter	38.0
3¼ in. thru 6 in.	29.0
Longer than 6 in.	15.0
⅝ in., 3 in. and shorter	27.0
3¼ in. thru 6 in.	17.0
Longer than 6 in.	10.0
¾ in. thru 1 in.:	
6 in. and shorter	18.0
Longer than 6 in.	7.0
1⅛ in. and larger:	
All lengths	7.0

Carriage, Plow & Lag Bolts, Hot Galvanized

½ in. and smaller:	
6 in. and shorter	28.0
Larger diameters and longer lengths	13.0

Carriage Bolts
Full Size Body (cut thread) & Undersize Body (rolled thread)
½ in. and smaller:

6 in. and shorter	46.0
Larger diameters and longer lengths	32.0

Lag, Plow, Tap, Blank, Step, Elevator, Tire, and Fitting Up Bolts
½ in. and smaller:

6 in. and shorter	46.0
Larger diameters and longer lengths	32.0

NUTS

(Container quantities and over)

Square Nuts, Reg. & Heavy:

All sizes	56.0

Square Nuts, Reg. & Heavy, Hot Galvanized:

All sizes	41.0

(Full container)

Hex Nuts, Reg. & Heavy Hot Pressed & Cold Punched:

¾ in. and smaller	62.0
⅞ in. to 1½ in., incl.	56.0
1⅝ in. and larger	51.5

Hex Nuts, Semifinished, Heavy (Incl. Slotted):

¾ in. and smaller	62.0
⅞ in. to 1½ in., incl.	56.0
1⅝ in. and larger	51.5

Hex Nuts, Finished (Incl. Slotted and Castellated):

⅞ in. and smaller	65.0
1 in. to 1½ in., incl.	57.0
1⅝ in. and larger	51.5

Semifinished Hex Nuts, Reg. (Incl. Slotted):

⅝ in. and smaller	62.0
¾ in. to ⅞ in., incl.	65.0
1 in. to 1½ in., incl.	57.0
1⅝ in. and larger	51.5

CAP AND SETSCREWS

(Base discounts, packages, per cent off list, f.o.b. mill)

Hex Head Capscrews, Coarse or Fine Thread, Bright:
6 in. and shorter:

⅝ in. and smaller	35.0
¾, ⅞, and 1 in.	16.0
Longer than 6 in.:	
⅜ in. and smaller	3.0
¾, ⅞, and 1 in.	+11.0

High Carbon, Heat Treated:
6 in. and shorter:

⅝ in. and smaller	20.0
¾, ⅞, and 1 in.	+ 5.0
Longer than 6 in.:	
⅝ in. and smaller	+19.0
¾, ⅞, and 1 in.	+39.0

Flat Head Capscrews:
¾ in. and smaller, 6 in. and shorter: +85.0

Setscrews, Square Head, Cup Point, Coarse Thread:
Through 1 in. diam.:
6 in. and shorter: + 5.0
Longer than 6 in.: +29.0

RIVETS

F.o.b. Cleveland and/or freight equalized with Pittsburgh, f.o.b. Chicago and/or freight equalized with Birmingham except where equalization is too great.
Structural ½ in., larger 12.85
$\frac{7}{8}$ in. and smaller by 6 in. and shorter: 15.0%

BOILER TUBES

Net base c.l. prices, dollars per 100 ft., mill; minimum wall thickness, cut lengths 10 to 24 ft, inclusive.

O.D. In.	B.W. Gage	Seamless H.R.	Seamless C.D.	Elec. Weld H.R.
1	13	....	27.24	23.13
1¼	13	....	32.25	24.41
1½	13	30.42	35.65	26.98
1¾	13	35.94	42.12	31.89
2	13	40.28	47.21	35.74
2¼	12	45.36	53.17	40.26
2½	12	49.24	57.72	43.70
2½	12	54.23	63.57	48.13
2¾	12	58.73	68.83	52.13
3	12	62.62	73.40	55.59

RAILWAY MATERIALS

Rails	Standard No. 1	Standard No. 2	Tee Rails All No. 2	Tee Rails 60 lb Under
Bessemer,Pa. U5	5.75	5.65	....	6.725
Ensley,Ala. T2	5.75	5.65	....	6.725
Fairfield,Ala. T2	....	....	....	6.725
Gary,Ind. U5	5.75	5.65	....	....
Huntington,W.Va. C15	....	....	....	6.50
Johnstown,Pa., B2	....	....	...(16)	6.725
Lackawanna,N.Y. B2	5.75	5.65	....	6.725
Minnequa,Colo. C10	5.75	5.65	....	7.22
Steelton,Pa. B2	5.75	5.65	....	....
Williamsport,Pa. S19	....	....	....	6.725

TIE PLATES

Fairfield,Ala. T2	6.875
Gary,Ind. U5	6.875
Lackawanna,N.Y. B2	6.875
Minnequa,Colo. C10	7.025
Seattle B3	7.025
Steelton,Pa. B2	6.875
Torrance,Calif. C11	6.875

JOINT BARS

Bessemer,Pa. U5	7.25
Fairfield,Ala. T2	7.25
Joliet,Ill. U5	7.25
Lackawanna,N.Y. B2	7.25
Minnequa,Colo. C10	7.25
Steelton,Pa. B2	7.25

AXLES

Ind Harbor,Ind. S13	9.125
Johnstown,Pa. B2	9.125

TRACK BOLTS, Untreated

Cleveland R2	15.35
KansasCity,Mo. S5	15.35
Lebanon,Pa. B2	15.35
Minnequa,Colo. C10	15.35
Pittsburgh P14	14.75
Seattle B3	15.85

SCREW SPIKES

Lebanon,Pa. B2	15.10

STANDARD TRACK SPIKES

Fairfield,Ala. T2	9.75
Ind.Harbor,Ind. I-2, Y1	10.10
KansasCity,Mo. S5	10.10
Lebanon,Pa. B2	10.10
Minnequa,Colo. C10	10.10
Pittsburgh J5	10.10
Seattle B3	10.60
S.Chicago Ill. R2	10.10
Struthers,O. Y1	10.10
Youngstown R2	10.10

Footnotes

(1) Chicago base.
(2) Angles, flats, bands.
(3) Merchant.
(4) Reinforcing.
(5) 1⅝ to under 1 7/16 in.; 1 7/16 to under 1 15/16 in., 6.70c; 1 15/16 to 8 in., inclusive, 7.05c.
(6) Chicago or Birm. base.
(7) Chicago base 2 cols. lower.
(8) 16 Ga. and heavier.
(9) Merchant quality; add 0.35c for special quality.
(10) Pittsburgh base.
(11) Cleveland & Pitts. base.
(12) Worcester, Mass., base.
(13) Add 0.25c for 17 Ga. & heavier.
(14) Gage 0.143 to 0.249 in.; for gage 0.142 and lighter, 5.80c.
(15) ¾" and thinner.
(16) 40 lb and under.
(17) Flats only; 0.25 in. & heavier.
(18) To dealers.
(19) Chicago & Pitts. base.
(21) New Haven, Conn. base.
(22) Deld. San Francisco Bay area.
(23) Special quality.
(24) Deduct 0.05c, finer than 15 Ga.
(25) Bar mill hands.
(26) Deld. in mill zone, 6.295c.
(27) Bar mill sizes.
(28) Bonderized.
(29) Youngstown base.
(30) Sheared; for universal mill add 0.45c
(31) Widths over ⅝ in.; 7.875c, for widths ⅝ in. and under by 0.125 in. and thinner.
(32) Buffalo base.
(33) To jobbers, deduct 20c.
(34) 9.60c for cut lengths.
(35) 72" and narrower.
(36) 54" and narrower.
(37) Chicago base, 10 points lower.
(38) 14 Ga. & lighter; 48" & narrower.
(39) 48" and narrower.
(40) Lighter than 0.035"; 0.035" and heavier, 0.25c higher.
(41) 9.10c for cut lengths.
(42) Mill lengths, f.o.b. mill; deld. in mill zone or within switching limits, 5.685c.
(43) 9 14½ Ga.
(44) To fabricators.
(48) 6-7 Ga.
(49) 3½ in. and smaller rounds; 9.65c, over 3½ in. and other shapes.

SEAMLESS STANDARD PIPE, Threaded and Coupled

Carload discounts from list, %

Size—Inches	⅛		¼		⅜		½		¾		1		1¼	
List Per Ft	37c		58.5c		76.5c		92c		$1.09		$1.48		$1.92	
Pounds Per Ft	3.68		5.82		7.62		9.20		10.89		14.81		19.18	
	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*
Aliquippa, Pa. J5	+12.25	+27.25	+5.75	+22.5	+3.25	+20	+1.75	+18.5	+1.75	+18.5	+2	+18.75	0.5	+16.25
Ambridge, Pa. N2	+12.25	....	+5.75	....	+3.25	....	+1.75	....	+1.75	....	+2	....	0.5	....
Lorain, O. N3	+12.25	+27.25	+5.75	+22.5	+3.25	+20	+1.75	+18.5	+1.75	+18.5	+2	+18.75	0.5	+16.25
Youngstown Y1	+12.25	+27.25	+5.75	+22.5	+3.25	+20	+1.75	+18.5	+1.75	+18.5	+2	+18.75	0.5	+16.25

ELECTRICWELD STANDARD PIPE, Threaded and Coupled

Carload discounts from list, %

Youngstown R2	+12.25	+27.25	+5.75	+22.5	+3.25	+20	+1.75	+18.5	+1.75	+18.5	+2	+18.75	0.5	+16.25

BUTTWELD STANDARD PIPE, Threaded and Coupled

Carload discounts from list, %

Size—Inches	⅛		¼		⅜		½		¾		1		1¼	
List Per Ft	5.5c		6c		6c		8.5c		11.5c		17c		23c	
Pounds Per Ft	0.24		0.42		0.57		0.85		1.13		1.68		2.28	
	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*
Aliquippa, Pa. J5	....	....	....	....	....	....	2.25	+13	5.25	+9	8.75	+4.5	11.25	+3.75
Alton, Ill. L1	....	....	....	....	....	....	0.25	+15	3.25	+11	6.75	+6.5	9.25	+5.75
Benwood, W. Va. W10	1.5	+25	+10.5	+34	+21	+42.5	2.25	+13	5.25	+9	8.75	+4.5	11.25	+3.75
Butler, Pa. F6	4.5	+22	+8.5	+32	+19.5	+41	....	....	....	....	....	....	....	....
Etna, Pa. N2	....	....	....	....	....	....	2.25	+13	5.25	+9	8.75	+4.5	11.25	+3.75
Fairless, Pa. N3	....	....	....	....	....	....	0.25	+15	3.25	+11	6.75	+6.5	9.25	+5.75
Fontana, Calif. K1	....	....	....	....	....	....	+10.75	+26	+7.75	+22	+4.25	+17.5	+1.75	+16.75
Indiana Harbor, Ind. Y1	....	....	....	....	....	....	1.25	+14	4.25	+10	7.75	+5.5	10.25	+6.25
Lorain, O. N3	....	....	....	....	....	....	2.25	+13	5.25	+9	8.75	+4.5	11.25	+3.75
Sharon, Pa. S4	4.5	+22	+8.5	+32	+19.5	+41	....	....	....	....	....	....	....	....
Sharon, Pa. M6	....	....	....	....	....	....	2.25	+13	5.25	+9	8.75	+4.5	11.25	+3.75
Sparrows Pt., Md. B2	0.5	+26	+11.5	+35	+22	+43.5	0.25	+15	3.25	+11	6.75	+6.5	9.25	+5.75
Wheatland, Pa. W9	4.5	+22	+8.5	+32	+19.5	+41	2.25	+13	5.25	+9	8.75	+4.5	11.25	+3.75
Youngstown R2, Y1	....	....	....	....	....	....	2.25	+13	5.25	+9	8.75	+4.5	11.25	+3.75

Size—Inches	1½		2		2½		3		3½		4	
List Per Ft	27.5c		37c		58.5c		76.5c		92c		$1.09	
Pounds Per Ft	2.72		3.68		5.82		7.62		9.20		10.89	
	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*
Aliquippa, Pa. J5	11.75	+2.75	12.25	+2.25	13.75	+2.5	13.75	+2.5	....	....	....	....
Alton, Ill. L1	9.75	+4.75	10.25	+4.25	11.75	+4.5	11.75	+4.5	1.25	+15.5	1.25	+15.5
Benwood, W. Va. W10	11.75	+2.75	12.25	+2.25	13.75	+2.5	13.75	+2.5	3.25	+13.5	3.25	+13.5
Etna, Pa. N2	11.75	+2.75	12.25	+2.25	13.75	+2.5	13.75	+2.5	3.25	+13.5	3.25	+13.5
Fairless, Pa. N3	9.75	+4.75	10.25	+4.25	11.75	+4.5	11.75	+4.5	1.25	+15.5	1.25	+15.5
Fontana, Calif. K1	+1.25	+15.75	+0.75	+15.25	0.75	+15.5	0.75	+15.5	+9.75	+26.5	+9.75	+26.5
Indiana Harbor, Ind. Y1	10.75	+3.75	11.25	+3.25	12.75	+3.5	12.25	+3.5	2.25	+14.5	2.25	+14.5
Lorain, O. N3	11.75	+2.75	12.25	+2.25	13.75	+2.5	13.75	+2.5	....	....	....	....
Sharon, Pa. M6	11.75	+2.75	12.25	+2.25	13.75	+2.5	13.75	+2.5	....	....	....	....
Sparrows Pt., Md. B2	9.75	+4.75	10.25	+4.25	11.75	+4.5	11.75	+4.5	1.25	+15.5	1.25	+15.5
Wheatland, Pa. W9	11.75	+2.75	12.25	+2.25	13.75	+2.5	13.75	+2.5	3.25	+13.5	3.25	+13.5
Youngstown R2, Y1	11.75	+2.75	12.25	+2.25	13.75	+2.5	13.75	+2.5	3.25	+13.5	3.25	+13.5

*Galvanized pipe discounts based on current price of zinc (11.00c, East St. Louis).

Stainless Steel

Representative prices, cents per pound; subject to current lists of extras

AISI Type	Rerolling—Ingot	Rerolling—Slabs	Forging Billets	H.R. Strip	H.R. Rods; C.F. Wire	Bars; Structural Shapes	Plates	Sheets	C.R. Strip; Flat Wire
201	22.00	27.00	....	36.00	40.00	42.00	39.25	48.50	45.00
202	23.75	30.25	36.50	39.00	40.75	43.00	40.00	49.25	49.25
301	23.25	28.00	37.25	37.25	42.00	44.25	41.25	51.25	47.50
302	25.25	31.50	38.00	40.50	42.75	45.00	42.25	52.00	52.00
302B	25.50	32.75	40.75	45.75	45.00	47.25	44.50	57.00	57.00
303	....	32.00	41.00	46.00	45.50	48.00	45.00	56.75	56.75
304	27.00	33.25	40.50	44.25	45.25	47.75	45.75	55.00	55.00
304L	....	....	48.25	51.50	53.00	55.50	53.50	63.25	63.25
305	28.50	36.75	42.50	47.50	45.25	47.75	46.25	58.75	58.75
308	30.75	38.25	47.25	50.25	52.75	55.75	55.25	63.00	63.00
309	39.75	49.50	57.75	64.50	63.75	67.00	66.00	80.50	80.50
310	49.75	61.50	78.00	84.25	86.50	91.00	87.75	96.75	96.75
314	....	....	77.50	....	86.50	91.00	87.75	99.00	104.25
316	39.75	49.50	62.25	69.25	69.25	73.00	71.75	80.75	80.75
316L	....	55.50	70.00	76.50	77.00	80.75	79.50	89.25	89.25
317	48.00	60.00	76.75	88.25	86.25	90.75	88.50	101.00	101.00
321	32.25	40.00	47.00	53.50	52.50	55.50	54.75	65.50	65.50
330	....	....	118.75	....	132.00	138.50	135.50	149.25	149.25
18-8 CbTa	37.00	46.50	55.75	63.50	61.50	64.75	64.75	74.25	74.25
403	....	....	28.25	....	32.00	33.75	30.00	40.25	40.25
405	19.50	25.50	29.75	36.00	33.50	35.25	32.50	46.75	46.75
410	16.75	21.50	28.25	31.00	32.00	33.75	30.00	40.25	40.25
416	....	....	28.75	....	32.50	34.25	31.25	48.25	48.25
420	26.00	33.50	34.25	41.75	39.25	41.25	40.25	62.00	62.00
430	17.00	21.75	28.75	32.00	32.50	34.25	31.00	40.75	40.75
430F	....	....	29.50	....	33.00	34.75	31.75	51.75	51.75
431	....	28.75	37.75	....	42.00	44.25	41.00	56.00	56.00
446	....	....	39.25	59.00	44.25	46.50	42.75	70.00	70.00

Stainless Steel Producers Are: Allegheny Ludlum Steel Corp.; American Steel & Wire Div., U. S. Steel Corp.; Anchor Drawn Steel Co., division of Vanadium-Alloys Steel Co.; Armco Steel Corp.; Babcock & Wilcox Co.; Bethlehem Steel Co.; J. Bishop & Co.; A. M. Byers Co.; G. O. Carlson Inc.; Carpenter Steel Co.; Carpenter Steel Co. of New England; Charter Wire Products; Crucible Steel Co. of America; Damascus Tube Co.; Dearborn Div., Sharon Steel Corp.; Wilbur B. Driver Co.; Driver-Harris Co.; Eastern Stainless Steel Corp.; Firth Sterling Inc.; Fort Wayne Metals Inc.; Green River Steel Corp., subsidiary of Jessop Steel Co.; Indiana Steel & Wire Co.; Ingersoll Steel Div., Borg-Warner Corp.; Ellwood Ivins Steel Tube Works Inc.; Jessop Steel Co.; Johnson Steel & Wire Co. Inc.; Stainless & Strip Div., Jones & Laughlin Steel Corp.; Joslyn Stainless Steels, division of Joslyn Mfg. & Supply Co.; Latrobe Steel Co.; Lukens Steel Co.; Maryland Fine & Specialty Wire Co. Inc.; McLoßth Steel Corp.; Metal Forming Corp.; Midvale-Heppenstall Co.; National Standard Co.; National Tube Div., U. S. Steel Corp.; Pacific Tube Co.; Page Steel & Wire Div., American Chain & Cable Co. Inc.; Pittsburgh Rolling Mills Inc.; Republic Steel Corp.; Riverside-Alloy Metal Div., H. K. Porter Company Inc.; Rodney Metals Inc.; Sawhill Tubular Products Inc.; Sharon Steel Corp.; Simonds Saw & Steel Co.; Specialty Wire Co. Inc.; Standard Tube Co.; Superior Steel Div., Copperweld Steel Co.; Superior Tube Co.; Swepco Tube Corp.; Techalloy Co. Inc.; Timken Roller Bearing Co.; Trent Tube Co., subsidiary of Crucible Steel Co. of America; Tube Methods Inc.; Ulbrich Stainless Steel Inc.; U. S. Steel Corp.; Universal Cyclops Steel Corp.; Vanadium-Alloys Steel Co.; Wall Tube & Metal Products Co.; Wallingford Steel Co., subsidiary of Allegheny Ludlum Steel Corp.; Washington Steel Corp.

Clad Steel

	Plates—Carbon Base 5%	10%	15%	20%	Sheets Carbon Base 20%
Stainless					
302	....	....	....	....	37.50
304	26.05	28.80	31.55	34.30	39.75
304L	30.50	33.75	36.95	40.15	....
316	38.20	42.20	46.25	50.25	58.25
316L	42.30	46.75	51.20	55.65	....
316 Cb	49.90	55.15	60.40	65.65	....
321	31.20	34.50	37.75	41.05	47.25
347	36.90	40.80	44.65	48.55	57.00
405	22.25	24.60	26.90	29.25	....
410	20.55	22.70	24.85	27.00	....
430	21.20	23.45	25.65	27.90	....
Inconel	48.90	59.55	70.15	80.85	....
Nickel	41.65	51.95	62.30	72.70	....
Nickel, Low Carbon	41.95	52.60	63.30	74.15	....
Monel	43.35	53.55	63.80	74.05	....

	Strip, Carbon Base—Cold Rolled— 10%	Both Sides
Copper*	....	40.65

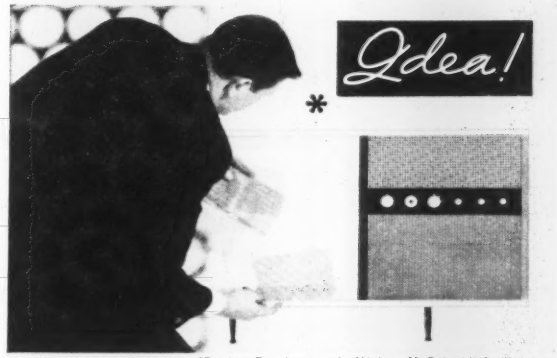
*Deoxidized. Production points: Stainless-clad sheets, New Castle, Ind. I-4; stainless-clad plates, Claymont, Del. C22, Coatesville, Pa. L7, New Castle, Ind. I-4, and Washington, Pa. J3; nickel, inconel, monel-clad plates, Coatesville L7; copper-clad strip, Carnegie, Pa. S18.

Tool Steel

Grade	$ per lb	Grade	$ per lb
Reg. Carbon (W-1)	0.330	W-Cr Hot Work (H-12)	0.530
Spec. Carbon (W-1)	0.385	V-Cr Hot Work (H-13)	0.550
Oil Hardening (O-1)	0.505	W Hot Wk. (H-21)	1.425-1.44
V-Cr Hot Work (H-11)	0.505	Hi-Carbon-Cr (D-11)	0.965

Grade by Analysis (%) W	Cr	V	Co	Mo	AISI Designation	$ per lb
18	4	1	....	....	T-1	1.840
18	4	2	....	....	T-2	2.005
13.5	4	3	....	....	T-3	2.105
18.25	4.25	1	4.75	....	T-4	2.545
18	4	2	9	....	T-5	2.915
20.25	4.25	1.6	12.25	....	T-6	4.330
13.75	3.75	2	5	....	T-8	2.495
1.5	4	1	....	8.5	M-1	1.200
6.4	4.5	1.9	....	5	M-2	1.345
6	4	3	....	6	M-3	1.540

Tool steel producers include: A4, A8, B2, B8, C4, C9, C13, C18, F2, J3, L3, M14, S8, U4, V2, and V3.



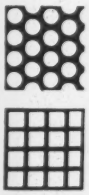
*Product Development by William M. Schmidt Associates.

H & K perforated metals serve a function of design

The orientation of television, AM-FM radio and phonographic elements into one modular housing containing all mechanical, electronic and control devices is one function of the mock-up illustrated. Another is the utilization of H & K perforated metal for the necessary ventilation and sound requirements of such equipment.

H & K Perforated Metal offers the Industrial Designer and other men of ideas, materials that are aesthetically interesting and functionally honest. If perforated materials can be utilized in your product, please contact us. Our sales engineers will be pleased to work with you.

Thousands of patterns



Write for Catalog

THE Harrington & King PERFORATING CO., INC.

Chicago Office and Warehouse
5627 Fillmore St., Chicago 44

New York Office and Warehouse
118 Liberty St., New York 6

ANOTHER *PANNIER* MASTER MARKER!

PANNIER'S STEEL LETTERS • FIGURES

- Longer lasting, less mushrooming
- Better impressions—clear, clean
- Letters, figures, or symbols
- In sets, assorted, or singly

Pannier Tested Steel Stamps provide you with clear, clean markings, maximum safety, longer life and highest quality.

BIRTHMARKED MATERIALS

Write for data. Wide variety of sizes available.

MARKING MASTER PANNIER MARKERS DEVICES

THE PANNIER CORPORATION

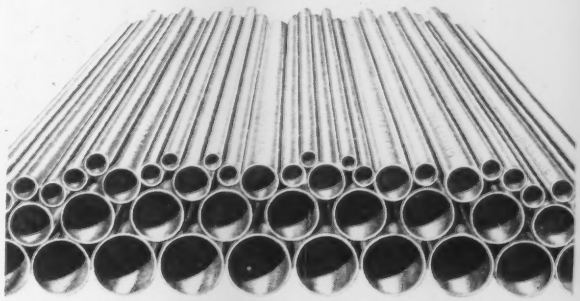
220 Sandusky Street • Pittsburgh 12, Pa.

Offices: Los Angeles • Chicago • Cleveland • Philadelphia • Birmingham

WHEELING SOFTITE COP-R-LOY

It's Wheeling SOFTITE for ductility

Wheeling SOFTITE *is ideal for every type of fabricating operation. That's because these ductile sheets have a tight galvanized coating that never flakes or peels, no matter how they're fabricated. In fact, we challenge – Anything that can be made of steel sheets can be made of* SOFTITE *Galvanized Sheets.*



...Wheeling Steel Pipe for strength

Jobs are easier and surer when the pipe you use bears the famous "Wheeling" name. For Wheeling Continuous Weld Steel Galvanized Pipe is consistently strong, ductile, uniform and easy to weld because it is always made of Wheeling's own controlled quality steel.

...Wheeling Steel Distributors for service

A nearby Wheeling Distributor wants to serve you! Backed by years of experience in serving customers just like you, he always carries a well-rounded stock of Wheeling Steel Products so he can quickly and efficiently fill all of your needs for galvanized sheets and steel pipe.

Find out for yourself about all of the advantages you can gain by using Wheeling SOFTITE, Wheeling Galvanized Steel Pipe and the many services of your nearby Wheeling Distributor. If you're not already doing business with him, why not contact the nearest sales office listed below for his name and address. Or write to Wheeling Steel Corporation, Wheeling, W. Va. **IT'S WHEELING STEEL**

WHEELING STEEL

District Sales Offices: Atlanta, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Detroit, Houston, New York, Philadelphia, St. Louis, San Francisco, Wheeling

Pig Iron

F.o.b. furnace prices in dollars per gross ton, as reported to STEEL. Minimum delivered prices are approximate.

	Basic	No. 2 Foundry	Malle-able	Besse-mer
Birmingham District				
Birmingham R2	62.00	62.50‡	....	....
Birmingham U6	....	62.50‡	66.50	....
Woodward,Ala. W15	62.00**	62.50‡	66.50	....
Cincinnati, deld.	....	70.20	....	....
Buffalo District				
Buffalo H1, R2	66.00	66.50	67.00	67.50
N.Tonawanda,N.Y. T9	....	66.50	67.00	67.50
Tonawanda,N.Y. W12	66.00	66.50	67.00	67.50
Boston, deld.	77.29	77.79	78.29	....
Rochester,N.Y., deld.	69.02	69.52	70.02	....
Syracuse,N.Y., deld.	70.12	70.62	71.12	....
Chicago District				
Chicago I-3	66.00	66.50	66.50	67.00
S.Chicago,Ill. R2	66.00	66.50	66.50	67.00
S.Chicago,Ill. W14	66.00	....	66.50	67.00
Milwaukee, deld.	69.02	69.52	69.52	70.02
Muskegon,Mich., deld.	....	74.52	74.52	....
Cleveland District				
Cleveland R2, A7	66.00	66.50	66.50	67.00
Akron,Ohio, deld.	69.52	70.02	70.02	70.52
Mid-Atlantic District				
Birdsboro,Pa. B10	68.00	68.50	69.00	69.50
Chester,Pa. P4	68.00	68.50	69.00	....
Swedeland,Pa. A3	68.00	68.50	69.00	69.50
New York, deld.	....	75.50	76.00	....
Newark,N.J., deld.	72.69	73.19	73.69	74.19
Philadelphia, deld.	70.41	70.91	71.41	71.99
Troy,N.Y. R2	68.00	68.50	69.00	69.50
Pittsburgh District				
Neville Island,Pa. P6	66.00	66.50	66.50	67.00
Pittsburgh (N&S sides), Aliquippa, deld.	....	67.95	67.95	68.48
McKeesRocks,Pa., deld.	....	67.60	67.60	68.13
Lawrenceville,Homestead, Wilmerding,Monaca,Pa., deld.	....	68.26	68.26	68.79
Verona,Trafford,Pa., deld.	68.29	68.82	68.82	69.35
Brackenridge,Pa., deld.	68.60	69.10	69.10	69.63
Midland,Pa. C18	66.00	....	....	....
Youngstown District				
Hubbard,Ohio Y1	....	....	66.50	....
Sharpsville Pa., S6	66.00	....	66.50	67.00
Youngstown Y1	....	....	66.50	....
Mansfield,Ohio, deld.	71.30	....	71.80	72.30
Duluth I-3	66.00	66.50	66.50	67.00
Erie,Pa. I-3	66.00	66.50	66.50	67.00
Everett,Mass. E1	67.50	68.00	68.50	....
Fontana,Calif. K1	75.00	75.50	....	....
Geneva,Utah C11	66.00	66.50	....	....
GraniteCity,Ill. G4	67.90	68.40	68.90	....
Ironton,Utah C11	66.00	66.50	....	....
Minnequa,Colo. C10	68.00	68.50	69.00	....
Rockwood,Tenn. T3	....	62.50‡	66.50	....
Toledo,Ohio I-3	66.00	66.50	66.50	67.00
Cincinnati, deld.	72.94	73.44	....	....

**Phos. 0.70-0.90%; Phos. 0.30-0.69%, $63.
‡Phos. 0.70-0.90%; Phos. 0.30-0.69%, $63.50.

PIG IRON DIFFERENTIALS

Silicon: Add 75 cents per ton for each 0.25% Si or percentage thereof over base grade, 1.75-2.25%, except on low phos. iron on which base is 1.75-2.00%.

Manganese: Add 50 cents per ton for each 0.25% manganese over 1% or portion thereof.

BLAST FURNACE SILVERY PIG IRON, Gross Ton

(Base 6.00-6.50% silicon; add $1 for each 0.50% silicon or portion thereof over the base grade within a range of 6.50 to 11.50%; starting with silicon over 11.50% and $1.50 per ton for each 0.50% silicon or portion thereof up to 14%; add $1 for each 0.50% Mn over 1%)

Jackson,Ohio I-3, J1	$78.00
Buffalo H1	79.25

ELECTRIC FURNACE SILVERY IRON, Gross Ton

(Base 14.01-14.50% silicon; add $1 for each 0.5% Si to 18%; $1.25 for each 0.50% Mn over 1%; $2 per gross ton premium for 0.045% max P)

CalvertCity,Ky. P15	$99.00
NiagaraFalls,N.Y. P15	99.00
Keokuk,Iowa Open-hearth & Fdry, $9 freight allowed K2	103.50
Keokuk,Iowa O.H. & Fdry, 12½ lb piglets, 16% Si, max fr'gt allowed up to $9, K2	106.50

LOW PHOSPHORUS PIG IRON, Gross Ton

Lyles,Tenn. T3 (Phos. 0.035% max)	$78.50
Rockwood,Tenn. T3 (Phos. 0.035% max)	78.50
Troy,N.Y. R2 (Phos. 0.035% max)	73.00
Philadelphia, deld.	81.67
Cleveland A7 (Intermediate) (Phos. 0.036-0.075% max)	71.00
Duluth I-3 (Intermediate) (Phos. 0.036-0.075% max)	71.00
Erie,Pa. I-3 (Intermediate) (Phos. 0.036-0.075% max)	71.00
Neville Island,Pa. P6 (Intermediate) (Phos. 0.036-0.075% max)	71.00

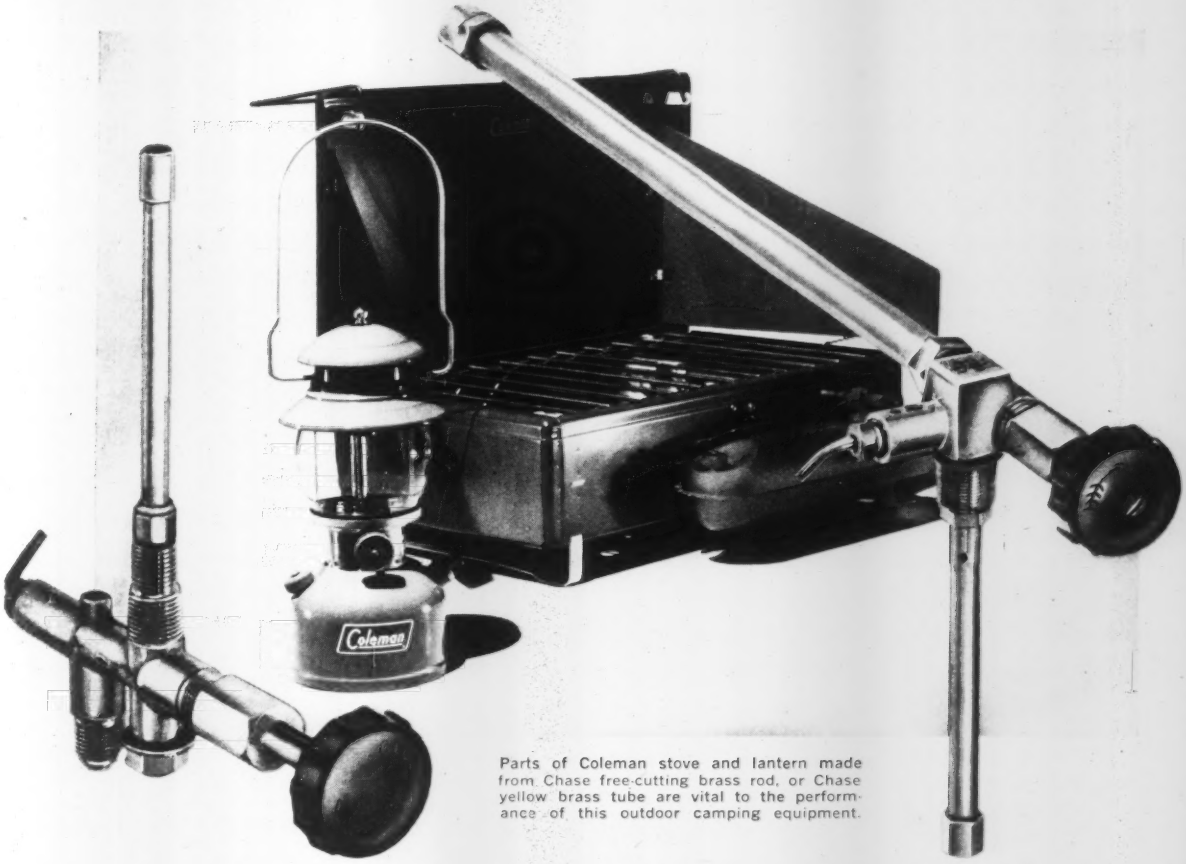
Steel Service Center Products

Representative prices, per pound, subject to extras, f.o.b. warehouse. City delivery charges are 15 cents per 100 lb except: Denver, Moline, Norfolk, Richmond, Washington, 20 cents; Baltimore, Boston, Los Angeles, New York, Philadelphia, Portland, Spokane, San Francisco, 10 cents; Atlanta, Birmingham, Chattanooga, Houston, Seattle, no charge.

	SHEETS				STRIP	BARS			Standard Structural Shapes	PLATES	
	Hot-Rolled	Cold-Rolled	Gal. 10 Ga.†	Stainless Type 302	Hot-Rolled*	H.R. Rounds	C.F. Rds.‡	H.R. Alloy 4140††[5]		Carbon	Floor
Atlanta	8.59§	9.86§	10.13	....	8.91	9.39	13.24#	....	9.40	9.29	11.21
Baltimore	8.00	8.90	10.32	....	8.70	8.65	12.33#	15.18	8.50	8.65	9.75
Birmingham	8.18	9.45	10.46	....	8.51	8.99	....	....	8.64	8.89	10.99
Boston	9.31	10.40	11.39	53.50	9.73	10.11	13.39#	15.71	10.01	10.02	11.87
Buffalo	8.25	9.00	11.07	55.98	8.75	9.15	11.45#	15.40	9.25	9.20	10.75
Chattanooga	8.35	9.69	9.65	....	8.40	8.77	10.46	....	8.88	8.80	10.66
Chicago	8.25	9.45	10.45	53.00	8.51	8.99	9.15	15.05	9.15	8.89	10.20
Cincinnati	8.43	9.51	10.50	52.43	8.83	9.31	11.53#	15.37	9.56	9.27	10.53
Cleveland	8.36	9.54	10.20	52.33	8.63	9.10	11.25#	15.16	9.39	9.13	10.44
Dallas	8.80	9.30	....	....	8.85	8.80	....	....	8.75	9.15	10.40
Denver	9.40	11.84	12.94	....	9.43	9.80	11.19	....	9.84	9.76	11.08
Detroit	8.51	9.71	10.81	56.50	8.88	9.30	9.51	15.33	9.56	9.26	10.46
Erie, Pa.	8.20	9.45	9.95[10]	....	8.60	9.10	11.25	....	9.35	9.10	10.60
Houston	8.40	8.90	10.29	52.00	8.45	8.40	11.60	15.75	8.35	8.75	10.10
Jackson, Miss.	8.52	9.79	....	....	8.57	8.94	10.68	....	8.97	8.90	10.74
Los Angeles	8.70[2]	10.80[2]	12.15[3]	57.60	9.15	9.10[2]	12.95[2]	16.35	9.00[2]	9.10[2]	11.30[3]
Memphis, Tenn.	8.55	9.80	10.45	....	8.58	9.32	11.96#	....	9.33	9.22	10.86
Milwaukee	8.39	9.59	10.59	....	8.65	9.13	9.39	15.19	9.22	9.05	10.34
Moline, Ill.	8.55	9.80	....	....	8.84	8.95	9.15	....	8.99	8.91	....
New York	8.87	10.13	10.56	53.08	9.64	9.99	13.25#	15.50	9.74	9.77	11.05
Norfolk, Va.	8.40	....	....	....	9.10	9.10	12.00	....	9.40	8.85	10.35
Philadelphia	8.00	9.25	11.17	52.69	8.70	8.65	11.50	15.48	8.50	8.75	9.75**
Pittsburgh	8.35	9.55	10.85	52.00	8.61	8.99	11.25#	15.05	9.00	8.89	10.20
Richmond, Va.	8.40	....	10.40	....	9.10	9.00	....	....	9.40	8.85	10.35
St. Louis	8.63	9.83	10.83	....	8.89	9.37	9.78	15.43	9.48	9.27	10.58
St. Paul	8.79	10.04	10.71	....	8.84	9.21	9.86	....	9.38	9.30	10.49
San Francisco	9.65	11.10	11.00	55.10	9.75	10.15	13.00	16.00	9.85	10.00	12.00
Seattle	8.70	10.30[2]	10.95[2]	55.02	8.75	8.85	14.70	16.80[3]	8.55	8.45	10.85
South'ton, Conn.	9.07	10.33	10.71	....	9.48	9.74	....	....	9.57	9.57	10.91
Spokane	9.95	11.15	12.20	57.38	10.00	10.10	14.70	16.80	9.80	9.70	12.10
Washington	8.88	....	....	....	9.36	9.56	10.94	....	9.79	9.26	10.74

*Prices do not include gage extras; †prices include gage and coating extras; ‡includes 35-cent bar quality extras; $42 in. and under; **⅛ in. and heavier; ††as annealed; ‡‡¾ in. to 4 in. wide, inclusive; #net price, 1 in. round C-1018.

Base quantities, 2000 to 4999 lb except as noted: cold-finished bars, 2000 lb and over except in Seattle, 2000 to 3999 lb; stainless sheets, 8000 lb except in Chicago, New York, Boston, Seattle 10,000 lb and in San Francisco, 2000 to 4999 lb; hot-rolled products on West Coast, 2000 to 9999 lb, except in Seattle, 30,000 lb and over; [2]—30,000 lb; [3]—1000 to 4999 lb; [5]—1000 to 1999 lb; [10]—2000 lb and over.



Parts of Coleman stove and lantern made from Chase free-cutting brass rod, or Chase yellow brass tube are vital to the performance of this outdoor camping equipment.

Dependable Coleman Camp Gear relies on parts of Chase® Brass!

Heart of the well-known Coleman pressure-type lantern and the gasoline-fired stove is the generator and the valve body. Both are made of Chase free-cutting brass rod—have been for years. Chase yellow brass tube is also used in Coleman units. They write: "Chase materials are an integral part of Coleman quality."

If what *you* make uses parts machined from brass rod, it will pay you to investigate what Chase free-cutting brass rod can do for you. You will find an ideal combination of all these characteristics:

- **Easy machinability.** Takes heavy feeds and high cutting speeds with short brittle chips.
- **Excellent finished surfaces**—smooth, clean, free from rough edges. Cleaner threads, sharper knurls and a surface that takes polishing, plating, lacquering or enameling with minimum preparation.
- **Outstanding resistance to corrosion**—and copper will never rust.
- **High scrap value** compared with other metals reduces end costs.
- **Longer tool life** gives you increased production at a lower unit cost.

Ask your nearest Chase Representative about Chase free-cutting brass rod for your machined parts. Or write Chase at Waterbury 20, Connecticut.

Chase®
BRASS & COPPER CO.
WATERBURY 20, CONN.
Subsidiary of
Kennecott Copper Corporation

The Nation's Headquarters for Brass, Copper and Stainless Steel

Atlanta Baltimore Boston Charlotte Chicago Cincinnati Cleveland Dallas Denver Detroit Grand Rapids Houston Indianapolis Kansas City, Mo. Los Angeles Milwaukee Minneapolis Newark New Orleans New York (Maspeth, L.I.) Philadelphia Pittsburgh Providence Rochester St. Louis San Francisco Seattle Waterbury

Refractories

Fire Clay Brick (per 1000)

High-Heat Duty: Ashland, Grahn, Hayward, Hitchens, Haldeman, Olive Hill, Ky., Athens, Troup, Tex., Beech Creek, Clearfield, Curwensville, Lock Haven, Lumber, Orviston, West Decatur, Winburne, Snow Shoe, Pa., Bessemer, Ala., Farber, Mexico, St. Louis, Vandalia, Mo., Ironton, Oak Hill, Parrall, Portsmouth, Ohio, Ottawa, Ill., Stevens Pottery, Ga., $140; Salina, Pa., $145; Niles, Ohio, $138; Cutler, Utah, $165.

Super-Duty: Ironton, Ohio, Vandalia, Mo., Olive Hill, Ky., Clearfield, Salina, Winburne, Snow Shoe, Pa., New Savage, Md., St. Louis, $185; Stevens Pottery, Ga., $195; Cutler, Utah, $233.

Silica Brick (per 1000)

Standard: Alexandria, Claysburg, Mt. Union, Sproul, Pa., Ensley, Ala., Ft. Matilda, Pa., Portsmouth, Ohio, Hawstone, Pa., $158; Warren, Niles, Windham, Ohio, Hays, Latrobe, Morrisville, Pa., $163; E. Chicago, Ind., Joliet, Rockdale, Ill. $168; Lehigh, Utah, $175; Los Angeles, $180.

Super-Duty: Sproul, Hawstone, Pa., Niles, Warren, Windham, Ohio, Leslie, Md., Athens, Tex., $157; Morrisville, Hays, Latrobe, Pa., $168; E. Chicago, Ind., $167; Curtner, Calif., $182.

Semisilica Brick (per 1000)

Clearfield, Pa., $140; Philadelphia, $137; Woodbridge, N. J., $135.

Ladle Brick (per 1000)

Dry Pressed: Alsey, Ill., Chester, New Cumberland, W. Va., Freeport, Johnstown, Merrill Station, Vanport, Pa., Mexico, Vandalia, Mo., Wellsville, Irondale, New Salisbury, Ohio, $96.75; Clearfield, Pa., Portsmouth, Ohio, $102.

High-Alumina Brick (per 1000)

50 *Per Cent:* St. Louis, Mexico, Vandalia, Mo., $235; Danville, Ill., $253; Philadelphia, Clearfield, Pa., $230; Orviston, Snow Shoe, Pa., $260.

60 *Per Cent:* St. Louis, Mexico, Vandalia, Mo., $295; Danville, Ill., $313; Clearfield, Orviston, Snow Shoe, Pa., $320; Philadelphia, $310.

70 *Per Cent:* St. Louis, Mexico, Vandalia, Mo., $335; Danville, Ill., $353; Clearfield, Orviston, Snow Shoe, Pa., $360; Philadelphia, $350.

Sleeves (per 1000)

Reesdale, Johnstown, Bridgeburg, Pa., St Louis, $188.

Nozzles (per 1000)

Reesdale, Johnstown, Bridgeburg, Pa., St Louis, $310.

Runners (per 1000)

Reesdale, Johnstown, Bridgeburg, Pa., $234.

Dolomite (per net ton)

Domestic, dead-burned, bulk, Billmeyer, Blue Bell, Williams, Plymouth Meeting, York, Pa., Millville, W. Va., Bettsville, Millersville, Martin, Woodville, Gibsonburg, Narlo, Ohio, $16.75; Thornton, McCook, Ill., $17; Dolly Siding, Bonne Terre, Mo., $15.60.

Magnesite (per net ton)

Domestic, dead-burned, ½ in. grains with fines: Chewelah, Wash., Luning, Nev., $16; ⅜ in. grains with fines: Baltimore, $73.

Fluorspar

Metallurgical grades, f.o.b. shipping point in Ill., Ky., net tons, carloads, effective CaF_2 content 72.5%, $37-$41; 70%, $36-$40; 60%, $33-$36.50. Imported, net ton, f.o.b. cars point of entry, duty paid, metallurgical grade: European, $29-$31, contract; Mexican, all rail, duty paid, $25; barge, Brownsville, Tex., $26.

Ores

Lake Superior Iron Ore

(Prices effective for the 1958 shipping season, gross ton, 51.50% iron natural, rail or vessel, lower lake ports.)

Mesabi bessemer	$11.60
Mesabi nonbessemer	11.45
Old Range bessemer	11.85
Old Range nonbessemer	11.70
Open-hearth lump	12.70
High phos	11.45

The foregoing prices are based on upper lake rail freight rates, lake vessel freight rates, handling and unloading charges, and taxes thereon, which were in effect Jan. 30, 1957, and increases or decreases after that date are absorbed by the seller.

Eastern Local Iron Ore

Cents per unit, deld. E. Pa.

New Jersey, foundry and basic 62-61% concentrates	18.00-19.00

Foreign Iron Ore

Cents per unit, c.i.f. Atlantic ports

Swedish basic, 65%	25.00
N. African hematite (spot)	nom
Brazilian iron ore, 68.5%	26.00

Tungsten Ore

Net ton, unit

Foreign wolframite, good commercial quality	$8.00-8.50*
Domestic, concentrates f.o.b. milling points	17.00-22.00

*Before duty.

Manganese Ore

Mn 46-48%, Indian (export tax included) $1.10 per long ton unit, c.i.f. U. S. ports, duty for buyer's account; other than Indian, nominal; contracts by negotiation.

Chrome Ore

Gross ton, f.o.b. cars New York, Philadelphia, Baltimore, Charleston, S. C., plus ocean freight differential for delivery to Portland, Oreg., Tacoma, Wash.

Indian and Rhodesian	
48% 3:1	$42.00-44.00
48% 2.8:1	38.00-40.00
48% no ratio	29.00-31.00
South African Transvaal	
44% no ratio	22.00-23.00
48% no ratio	29.00-31.00
Turkish	
48% 3:1	51.00-55.00
Domestic	
Rail nearest seller	
18% 3:1	39.00

Molybdenum

Sulfide concentrate, per lb of Mo content, mines, unpacked	$1.23

Antimony Ore

Per short ton unit of Sb content, c.i.f. seaboard	
50-55%	$2.25-2.40
60-65%	2.50-3.10

Vanadium Ore

Cents per lb V_2O_5

Domestic	31.00

Metallurgical Coke

Price per net ton

Beehive Ovens

Connellsville, Pa., furnace	$14.75-15.75
Connellsville, Pa., foundry	18.00-18.50

Oven Foundry Coke

Birmingham, ovens	$28.85
Cincinnati, deld.	31.84
Buffalo, ovens	30.50
Camden, N. J., ovens	29.50
Detroit, ovens	30.50
Pontiac, Mich., deld.	32.45
Saginaw, Mich., deld.	34.03
Erie, Pa., ovens	30.50
Everett, Mass., ovens:	
New England, deld.	31.55*
Indianapolis, ovens	29.75
Ironton, Ohio, ovens	29.00
Cincinnati, deld.	31.84
Kearny, N. J., ovens	29.75
Milwaukee, ovens	30.50
Neville Island (Pittsburgh), Pa., ovens	29.25
Painesville, Ohio, ovens	30.50
Cleveland, deld.	32.69
Philadelphia, ovens	29.50
St. Louis ovens	31.50
St. Paul, ovens	28.75
Chicago, deld.	33.29
Swedeland, Pa., ovens	29.50
Terre Haute, Ind., ovens	29.75

*Ore within $5.15 freight zone from works.

Coal Chemicals

Spot, cents per gallon, ovens

Pure benzene	31.00‡
Toluene, one deg (deld.)	25.00*
Industrial xylene	29.00§
Per ton, bulk, ovens	
Ammonium sulfate	$32.00-35.00†

Cents per pound, producing point

Phenol: Grade 1, 17.50; Grade 2-3, 15.50; Grade 4, 17.50; Grade 5, 16.50; Grade 6, 14.50.

Effective: *Apr. 12; †July 1; ‡July 8; §Aug. 12.

Metal Powder

(Per pound f.o.b. shipping point in ton lots for minus 100 mesh, except as noted)

	Cents
Sponge Iron, Swedish: deld. east of Mississippi River, ocean bags 23,000 lb and over..	10.50
F.o.b. Riverton or Camden, N. J., west of Mississippi River.	9.50
Sponge Iron, Domestic, 99 + % Fe: Deld. east of Mississippi River, 23,000 lb and over	10.50
Electrolytic Iron, Melting stock, 99.87% Fe, irregular fragments of ⅛ in. x 1.3 in.	28.75
(In contract lots of 240 tons price is 22.75c)	
Annealed, 99.5% Fe..	36.50
Unannealed (99 + % Fe)	36.00
Unannealed (99 + % Fe) (minus 325 mesh)	59.00
Powder Flakes (minus 16, plus 100 mesh)..	29.00
Carbonyl Iron: 98.1-99.9%, 3 to 20 microns, depending on grade, 93.00-290.00 in standard 200-lb containers; all minus 200 mesh.	
Aluminum: Atomized, 500-lb drum, freight allowed Carlots	38.50
Ton lots	40.50
Antimony, 500-lb lots	42.00*
Brass, 5000-lb lots	31.50-47.00†
Bronze, 5000-lb lots	47.30-51.50†
Copper: Electrolytic	14.75*
Reduced	14.75*
Lead	7.50*
Manganese: Minus 35 mesh	64.00
Minus 100 mesh	70.00
Minus 200 mesh	75.00
Nickel, unannealed	74.00
Nickel-Silver, 5000-lb lots	49.00-53.70†
Phosphor-Copper, 5000-lb lots	59.30
Copper (atomized) 5000-lb lots	39.80-48.30†
Silicon	47.50
Solder	7.00*
Stainless Steel, 301	$1.07
Stainless Steel, 316	$1.26
Tin	14.00*
Zinc, 5000-lb lots	18.50-31.70‡
Tungsten:	Dollars
Melting grade, 99% 60 to 200 mesh, nominal:	
1000 lb and over	3.15
Less than 1000 lb	3.30
Chromium, electrolytic 99.8% Cr min metallic basis	5.00

*Plus cost of metal, †Depending on composition, ‡Depending on mesh.

Electrodes

Threaded with nipple; unboxed, f.o.b. plant

GRAPHITE

Inches Diam	Length	Per 100 lb
2	24	$60.75
2½	30	39.25
3	40	37.00
4	40	35.00
5¾	40	34.75
6	60	31.50
7	60	28.25
8, 9, 10	60	28.00
12	72	26.75
14	60	26.75
16	72	25.75
17	60	26.25
18	72	26.25
20	72	25.25
24	84	26.00

CARBON

8	60	13.30
10	60	13.00
12	60	12.95
14	60	12.85
14	72	11.95
17	60	11.85
17	72	11.40
20	84	11.40
20	90	11.00
24	72, 84	11.25
24	96	10.95
30	84	11.05
40, 35	110	10.70
40	100	10.70

Imported Steel

(Base per 100 lb, landed, duty paid, based on current ocean rates. Any increase in these rates is for buyer's account. Source of shipment: Western continental European countries.)

	North Atlantic	South Atlantic	Gulf Coast	West Coast
Deformed Bars, Intermediate, ASTM-A 305	$5.10	$5.10	$5.00	$5.45
Bar Size Angles	5.05	5.05	5.00	5.38
Structural Angles	5.05	5.05	5.05	5.38
I-Beams	5.11	5.11	5.11	5.45
Channels	5.11	5.11	5.11	5.45
Plates (basic bessemer)	6.62	6.62	6.62	6.94
Sheets, H.R.	8.20	8.20	8.20	8.50
Sheets, C.R. (drawing quality)	8.75	8.75	8.75	9.12
Furring Channels, C.R., 1000 ft, ¾ x 0.30 lb per ft	25.71	25.59	25.59	26.46
Barbed Wire (†)	6.65	6.65	6.65	7.00
Merchant Bars	5.40	5.40	5.35	5.90
Hot-Rolled Bands	7.15	7.15	7.15	7.55
Wire Rods, Thomas Commercial No. 5	5.05	5.18	5.00	5.35
Wire Rods, O.H. Cold Heading Quality No. 5	5.80	5.93	5.75	6.05
Bright Common Wire Nails (§)	8.02	8.02	7.92	8.20

†Per 82 lb net reel. §Per 100-lb kegs, 20d nails and heavier.

strong as a weld

EQUIPTO

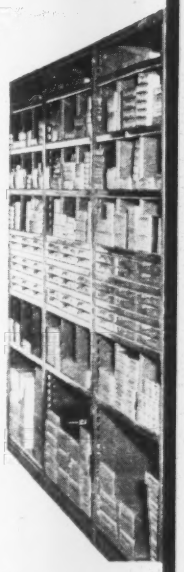
Iron-Grip®

Steel Shelving

with the exclusive stud

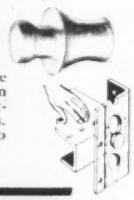
Exclusive steel stud permits 60% faster shelf adjustment on 1½" centers without nuts, bolts or tools. The more you load the shelf the tighter it grips, yet shelf may be moved easily.

Equipto Iron-Grip Shelving is immediately available from stock in all sizes, either open or closed, with or without dividers, bin fronts, drawers or label holders. Write for complete reference manual No. 485.



Stud eliminates clips, nuts, bolts and tools

A slope in the keyhole joins with the taper on the stud to form the tightest and strongest of grips. An exclusive Equipto feature.



Equipto

634 Prairie Avenue
Aurora, Illinois

Manufacturer of World's Finest

Steel Shelving-Slotted Angle-Bins-Drawer Units-Lockers-Carts-Benches.

DYKEM STEEL BLUE®

Stops Losses

making Dies and Templates

Popular package is 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.

Write for sample on company letterhead

THE DYKEM COMPANY
2303H North 11th St. • St. Louis 6, Mo.

INTRODUCTION TO THE STUDY OF HEAT TREATMENT OF METALLURGICAL PRODUCTS

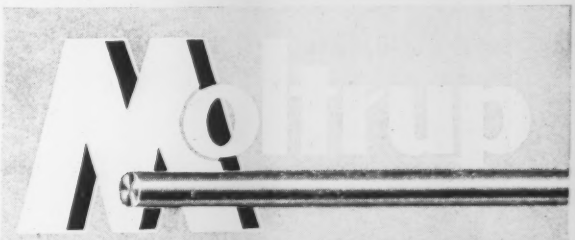
By Albert Portevin

Fundamental knowledge and essential principles of heat treatment of steel are presented in simple and understandable manner. Research engineers, metallurgical students and steel plant metallurgists engaged in metallurgical investigations and the heat treatment of ferrous and non-ferrous metals will find this book of inestimable value.

246 pages **4 tables**
69 illustrations **Price $5.00 Postpaid**

THE PENTON PUBLISHING CO.

Book Department, 1213 W. 3rd St., Cleveland 13, O.



CLOSE-TOLERANCE STEEL PRODUCTS SINCE 1892

MACHINE KEYS
WOODRUFF KEYS
SPECIAL KEYS
MACHINE RACK
•
TAPER PINS
STRAIGHT PINS
KNURLED PINS
SPECIAL PINS

Close tolerances mean better results for MOLTRUP customers. No chattering — no misfits — no wasted time. Special keys and pins made to your specifications — the exact tolerances ordered.

KEYS: Gib Head, Feather, H-P, Woodruff, and all other types. PINS: Taper, Threaded Taper, Dowel, Knurled, any other type desired. Made from fine steel screw stock, Monel, brass, aluminum, or other metals. MOLTRUP'S modern high-speed production combines precision quality with low cost.

COLD DRAWN STEEL

All standard shapes — any special shape . . . carbon — alloy — leaded steels . . . close-tolerance key stock.

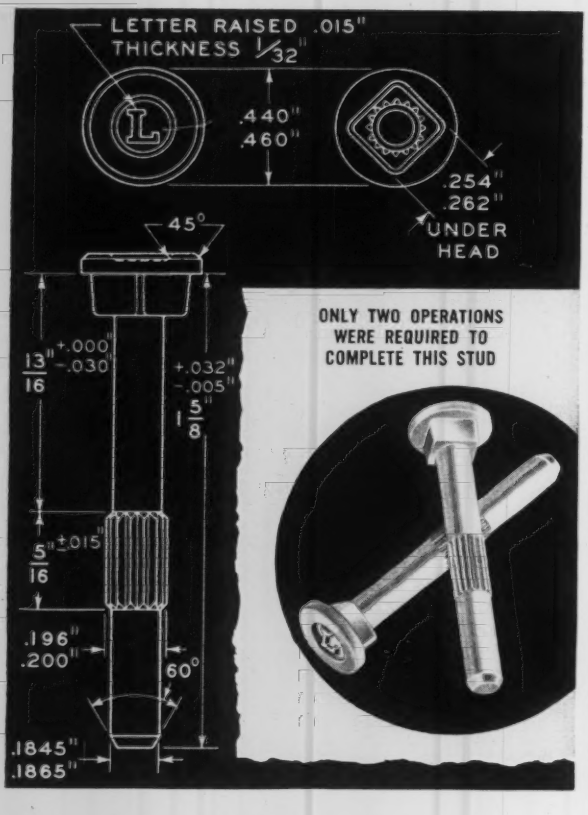
We invite consultation on your problems. — Try us for emergency needs.

Phone: Tilden 6-3100

(See telephone directory in cities listed)

Pittsburgh, Pa. Bala Cynwyd, Pa. Erie, Pa. Chicago, Ill.
Detroit, Mich. New York, N. Y. Syracuse, N. Y. Cincinnati, O.
Cleveland, O. Los Angeles, Calif.

S-2



skill high – cost low

by cold heading

Cold heading was the only method seriously considered for making this stud. It required exceptional skill to produce this part economically and still meet quality requirements.

By using special adapters on cold headers, Progressive evolved a low cost method for producing studs with sharp, well-defined corners and clean, rolled knurling on the stem to facilitate assembly.

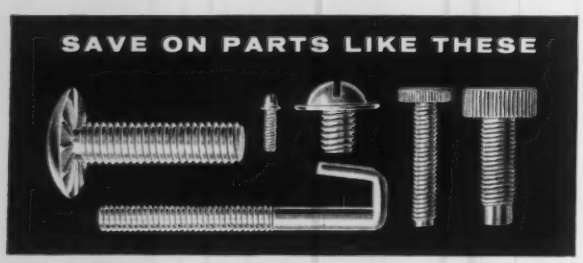
Progressive can combine skill and economy for you, too — and give you naturally stronger fasteners. Write for more case histories in our *"Bank Book of Savings in Cold Heading."*

MACHINE SCREWS AND NUTS, SEMS FASTENERS,
SLOTTED TAPPING SCREWS AND PHILLIPS HEAD SCREWS

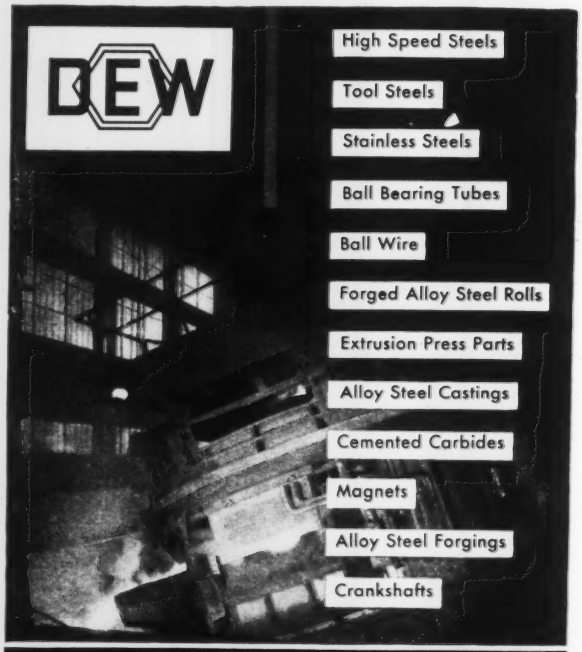
THE PROGRESSIVE MFG. CO.

Division of The Torrington Company

76 Norwood St., Torrington, Connecticut



AMONG OPERATIONS PERFORMED BY PROGRESSIVE are heading and extruding simultaneously; flattening; piercing; drilling; bending; pointing; fluted or diamond knurling; trimming; turning tenons, shoulders or recesses; struck or sawed slotting; notching.



MARATHON SPECIALTY STEELS, INC.

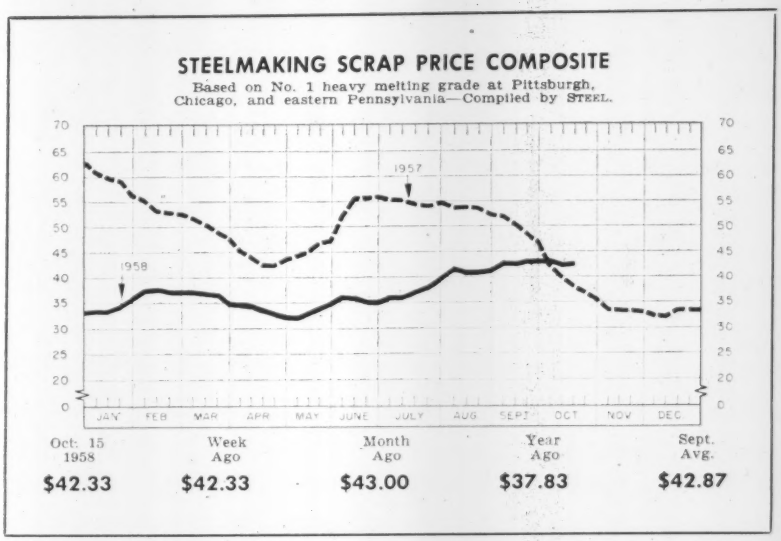
99 Park Avenue
New York 16, N.Y.
Telephone:
MUrray Hill 2-2817

If

METALWORKING PLANTS ARE YOUR PROSPECTS...

✔ ✔ ✔

STEEL can put you in touch with the important ones, those that do more than 92% of the industry's business. Tell the buyers and specifiers in these plants of the machines or materials you have for sale through an "Equipment—Materials" advertisement. For rates write STEEL, Penton Building, Cleveland 13, O.



Scrap Fluctuates in Narrow Range

STEEL's composite on the prime grade holds unchanged at $42.33 following the preceding week's decline of 67 cents. Sluggish demand continues despite rising steel operations

Scrap Prices, Page 316

Philadelphia—A lower price on No. 2 bundles, due to an excess of this material at dealers' yards, has weakened the market on all open hearth grades here. No. 1 heavy melting, No. 1 bundles, and No. 1 busheling are off $1 a ton, now being quoted $41, delivered. No. 2 heavy melting is $37 and No. 2 bundles $25. Some No. 2 bundles are now moving by truck to the Pittsburgh area.

New York — Brokers' buying prices are unchanged throughout the list. Domestic consumers are marking time, but the general undertone of the market is firm, with ingot production increasing and export trading fairly active.

Pittsburgh — Although district steelmaking operations are at the highest level of the year (68.5 per cent of capacity), little activity is to be found in the scrap market. The mills are relying on inventories or using hot metal to support higher production.

One major producer bought a small tonnage of No. 2 heavy melting at $31, and paid $33 for No. 2 bundles originating outside the district. Dealers are bearish about October but bullish for the next three months.

Chicago—Prices have firmed up slightly from the lows registered a week ago. Some grades now are quoted $1 to $2 higher. An important district mill continues to post $45 as its offering price on No. 1 industrial heavy melting although that grade has been sold for $43.

Cleveland—Except for a purchase of No. 2 bundles at $30.50 by a local mill, there wasn't much activity in the scrap market last week, here or in the Valley. The bundles purchased put the price on that grade up about $2.50 a ton. Otherwise, prices are unchanged with No. 1 heavy melting $39.50-$40.50 here, and $43-$44 in the Valley.

Some scrap traders don't look for demand for dealer scrap to be materially stimulated until steelmaking operations reach around 85 per cent of capacity.

Buffalo—Despite rising steelmaking operations, the scrap market is unchanged. Dealers say demand is relatively light and consumers are holding sizable inventories. Also, they are generating more scrap of their own now that steel operations are up.

St. Louis—Dealers' yard receipts have fallen off considerably. The market is firm, but lacks evidences of stimulation.

Birmingham — The market continues active with prices steady at the higher levels established a week ago on several grades. Dealers feel the top of the market has not yet been reached, except on the cast grades.

Houston—Shippers are busy closing out October commitments. Early forecasts for November indicate there will be little, if any, change in prices.

The embargo on car permits to Mexican border points has been lifted and some 10,000 tons of scrap owed on old orders are expected to move. One broker says south-of-the-border demand is potentially strong.

Los Angeles—Dealers report increased offshore activity. The market undertone is firmer, but posted prices are unchanged.

San Francisco—Possibility of a price change in this market over the remainder of the year is slight, in the opinion of scrap dealers.

Seattle — With mill inventories heavy, scrap dealers don't look for much activity in this market between now and yearend.

Iron Ore . . .

Iron Ore Prices, Page 312

Dravo Corp., Pittsburgh, has booked a contract from the Commission of Public Docks, Portland, Oreg., for construction of a 900-ton-per-hour capacity traveling bulk unloading tower.

The 1958 navigation season will end this week for 26 ore carriers of the largest fleet on the Great Lakes.

(*Please turn to Page* 321)

Since this, Baltimore's largest hotel, is normally favored by most visitors, we suggest that you write or teletype BA263 for reservations.

Iron and Steel Scrap

Consumer prices per gross ton, except as otherwise noted, including brokers' commission, as reported to STEEL, Oct. 15, 1958. *Changes shown in italics.*

STEELMAKING SCRAP COMPOSITE

Oct. 15	$42.33
Oct. 8	42.33
Sept. Avg	42.87
Oct. 1957	37.37
Oct. 1953	32.75

Based on No. 1 heavy melting grade at Pittsburgh, Chicago, and eastern Pennsylvania.

PITTSBURGH

No. 1 heavy melting	43.00-44.00
No. 2 heavy melting	34.00-35.00
No. 1 dealer bundles	43.00-44.00
No. 2 bundles	31.00-32.00
No. 1 busheling	43.00-44.00
No. 1 factory bundles	47.00-48.00
Machine shop turnings	20.00-21.00
Mixed borings, turnings	20.00-21.00
Short shovel turnings	24.00-25.00
Cast iron borings	24.00-25.00
Cut structurals:	
2 ft and under	47.00-48.00
3 ft lengths	46.00-47.00
Heavy turnings	*44.00-45.00*
Punchings & plate scrap	47.00-48.00
Electric furnace bundles	48.00-49.00

Cast Iron Grades

No. 1 cupola	*44.00-45.00*
Stove plate	41.00-42.00
Unstripped motor blocks	31.00-32.00
Clean auto cast	39.00-40.00
Drop broken machinery	51.00-52.00

Railroad Scrap

No. 1 R.R. heavy melt.	47.00-48.00
Rails, 2 ft and under	57.00-58.00
Rails, 18 in. and under	58.00-59.00
Random rails	54.00-55.00
Railroad specialties	52.00-53.00
Angles, splice bars	52.00-53.00
Rails, rerolling	60.00-61.00

Stainless Steel Scrap

18-8 bundles & solids	225.00-230.00
18-8 turnings	*120.00-125.00*
430 bundles & solids	125.00-130.00
430 turnings	50.00-52.00

CHICAGO

No. 1 hvy melt, indus.	*43.00-45.00*
No. 1 hvy melt, dealer	*40.00-41.00*
No. 2 heavy melting	34.00-35.00
No. 1 factory bundles	45.00-46.00
No. 1 dealer bundles	41.00-42.00
No. 2 bundles	28.00-29.00
No. 1 busheling, indus.	*43.00-45.00*
No. 1 busheling, dealer	40.00-41.00
Machine shop turnings	21.00-22.00
Mixed borings, turnings	23.00-24.00
Short shovel turnings	23.00-24.00
Cast iron borings	23.00-24.00
Cut structurals, 3 ft	46.00-47.00
Punchings & plate scrap	47.00-48.00

Cast Iron Grades

No. 1 cupola	*45.00-46.00*
Stove plate	*43.00-44.00*
Unstripped motor blocks	*37.00-38.00*
Clean auto cast	*51.00-52.00*
Drop broken machinery	*51.00-52.00*

Railroad Scrap

No. 1 R.R. heavy melt.	45.00-46.00
R.R. malleable	*55.00-56.00*
Rails, 2 ft and under	*58.00-59.00*
Rails, 18 in. and under	*59.00-60.00*
Angles, splice bars	*54.00-55.00*
Axles	67.00-68.00
Rails, rerolling	*62.00-63.00*

Stainless Steel Scrap

18-8 bundles & solids	*215.00-220.00*
18-8 turnings	120.00-125.00
430 bundles & solids	115.00-120.00
430 turnings	55.00-60.00

YOUNGSTOWN

No. 1 heavy melting	43.00-44.00
No. 2 heavy melting	30.00-31.00
No. 1 busheling	43.00-44.00
No. 1 bundles	43.00-44.00
No. 2 bundles	30.00-31.00
Machine shop turnings	15.00-16.00
Short shovel turnings	20.00-21.00
Cast iron borings	20.00-21.00
Low phos.	45.00-46.00
Electric furnace bundles	45.00-46.00

Railroad Scrap

No. 1 R.R. heavy melt.	45.00-46.00

CLEVELAND

No. 1 heavy melting	39.50-40.50
No. 2 heavy melting	26.00-27.00
No. 1 factory bundles	44.00-45.00
No. 1 bundles	39.50-40.50
No. 2 bundles	*30.50-31.50*
No. 1 busheling	39.50-40.50
Machine shop turnings	14.00-15.00
Short shovel turnings	20.00-21.00
Mixed borings, turnings	20.00-21.00
Cast iron borings	20.00-21.00
Cut foundry steel	40.00-41.00
Cut structurals, plates 2 ft and under	47.00-48.00
Low phos. punchings & plate	41.00-42.00
Alloy free, short shovel turnings	22.00-23.00
Electric furnace bundles	40.50-41.50

Cast Iron Grades

No. 1 cupola	44.00-45.00
Charging box cast	37.00-38.00
Heavy breakable cast	36.00-37.00
Stove plate	43.00-44.00
Unstripped motor blocks	32.00-33.00
Brake shoes	36.00-37.00
Clean auto cast	49.00-50.00
Burnt cast	33.00-34.00
Drop broken machinery	49.00-50.00

Railroad Scrap

R.R. malleable	60.00-61.00
Rails, 2 ft and under	57.00-58.00
Rails, 18 in. and under	58.00-59.00
Rails, random lengths	52.00-53.00
Cast steel	49.00-50.00
Railroad specialties	50.00-51.00
Uncut tires	43.00-44.00
Angles, splice bars	50.00-51.00
Rails, rerolling	56.00-57.00

Stainless Steel

(Brokers' buying prices; f.o.b. shipping point)

18-8 bundles, solids	200.00-210.00
18-8 turnings	110.00-115.00
430 clips, bundles, solids	100.00-110.00
430 turnings	40.00-50.00

ST. LOUIS

(Brokers' buying prices)

No. 1 heavy melting	37.00
No. 2 heavy melting	35.00
No. 1 bundles	39.00
No. 2 bundles	28.00
No. 1 busheling	39.00
Machine shop turnings	20.00†
Short shovel turnings	22.00†

Cast Iron Grades

No. 1 cupola	*49.00*
Charging box cast	40.00
Heavy breakable cast	38.00
Unstripped motor blocks	39.00
Clean auto cast	49.00
Stove plate	46.00

Railroad Scrap

No. 1 R.R. heavy melt.	45.50
Rails, 18 in. and under	52.00†
Rails, random lengths	47.50
Rails, rerolling	62.25
Angles, splice bars	47.00

BIRMINGHAM

No. 1 heavy melting	39.00-40.00
No. 2 heavy melting	30.00-31.00†
No. 1 bundles	39.00-40.00
No. 2 bundles	25.00-26.00
No. 1 busheling	39.00-40.00
Cast iron borings	*13.00-14.00*
Machine shop turnings	24.00-25.00
Short shovel turnings	25.00-26.00
Bars, crops and plates	46.00-47.00
Structurals & plates	45.00-46.00
Electric furnace bundles	40.00-41.00
Electric furnace:	
2 ft and under	38.00-39.00
3 ft and under	37.00-38.00

Cast Iron Grades

No. 1 cupola	54.00-55.00
Stove plate	54.00-55.00
Unstripped motor blocks	43.00-44.00
Charging box cast	29.00-30.00
No. 1 wheels	43.00-44.00

Railroad Scrap

No. 1 R.R. heavy melt.	39.00-40.00
Rails, 18 in. and under	51.00-52.00
Rails, rerolling	59.00-60.00
Rails, random lengths	48.00-49.00
Angles, splice bars	48.00-49.00

PHILADELPHIA

No. 1 heavy melting	*41.00*
No. 2 heavy melting	*37.00*
No. 1 bundles	*41.00*
No. 2 bundles	*25.00*
No. 1 busheling	*41.00*
Electric furnace bundles	43.00
Mixed borings, turnings	20.00-21.00†
Short shovel turnings	24.00-25.00†
Machine shop turnings	20.00-21.00†
Heavy turnings	34.00-35.00†
Structurals & plate	44.00-45.00
Couplers, springs, wheels	48.00
Rail crops, 2 ft & under	58.00-60.00

Cast Iron Grades

No. 1 cupola	41.00
Heavy breakable cast	*43.00*
Malleable	58.00
Drop broken machinery	49.00-50.00

NEW YORK

(Brokers' buying prices)

No. 1 heavy melting	33.00-34.00
No. 2 heavy melting	30.00-31.00
No. 1 bundles	33.00-34.00
No. 2 bundles	19.00-20.00
Machine shop turnings	10.00-11.00
Mixed borings, turnings	11.00-12.00
Short shovel turnings	14.00-15.00
Low phos. (structurals & plates)	37.00-38.00

Cast Iron Grades

No. 1 cupola	36.00-37.00
Unstripped motor blocks	28.00-29.00
Heavy breakable	33.00-34.00

Stainless Steel

18-8 sheets, clips, solids	185.00-190.00
18-8 borings, turnings	90.00-95.00
410 sheets, clips, solids	60.00-65.00
430 sheets, clips, solids	85.00-90.00

BUFFALO

No. 1 heavy melting	35.00-36.00
No. 2 heavy melting	29.00-30.00
No. 1 bundles	35.00-36.00
No. 2 bundles	27.00-28.00
No. 1 busheling	35.00-36.00
Mixed borings, turnings	17.00-18.00
Machine shop turnings	15.00-16.00
Short shovel turnings	19.00-20.00
Cast iron borings	17.00-18.00
Low phos. structurals and plate, 2 ft and under	43.00-44.00

Cast Iron Grades (F.o.b. shipping point)

No. 1 cupola	44.00-45.00
No. 1 machinery	48.00-49.00

Railroad Scrap

Rails, random lengths	53.00-54.00
Rails, 3 ft and under	59.00-60.00
Railroad specialties	43.00-44.00

CINCINNATI

(Brokers' buying prices; f.o.b. shipping point)

No. 1 heavy melting	37.50-38.50
No. 2 heavy melting	32.50-33.50
No. 1 bundles	37.50-38.50
No. 2 bundles	25.00-26.00
No. 1 busheling	37.50-38.50
Machine shop turnings	18.00-19.00
Mixed borings, turnings	18.00-19.00
Short shovel turnings	20.00-21.00
Cast iron borings	18.00-19.00
Low phos, 18 in.	45.00-46.00

Cast Iron Grades

No. 1 cupola	43.00-44.00
Heavy breakable cast	36.00-37.00
Charging box cast	34.00-35.00
Drop broken machinery	47.00-48.00

Railroad Scrap

No. 1 R.R. heavy melt.	44.00-45.00
Rails, 18 in. and under	55.00-56.00
Rails, random lengths	49.00-50.00

HOUSTON

(Brokers' buying prices; f.o.b. cars)

No. 1 heavy melting	40.00
No. 2 heavy melting	34.00
No. 1 bundles	40.00
No. 2 bundles	25.00
Machine shop turnings	17.00
Short shovel turnings	20.00
Low phos. plates & structurals	45.50

Cast Iron Grades

No. 1 cupola	47.00
Heavy breakable	30.00†
Foundry malleable	*41.00*
Unstripped motor blocks	37.00

Railroad Scrap

No. 1 R.R. heavy melt.	38.00†

BOSTON

(Brokers' buying prices; f.o.b. shipping point)

No. 1 heavy melting	29.00-30.00
No. 2 heavy melting	*23.00-24.00*
No. 1 bundles	29.00-30.00
No. 2 bundles	*17.00-18.00†*
No. 1 busheling	29.00-30.00
Machine shop turnings	9.00-10.00
Short shovel turnings	12.00-13.00
No. 1 cast	33.00-34.00
Mixed cupola cast	33.00-34.00
No. 1 machinery cast	36.00-38.00

DETROIT

(Brokers' buying prices; f.o.b. shipping point)

No. 1 heavy melting	30.00-31.00
No. 2 heavy melting	19.00-20.00
No. 1 bundles	31.00-32.00
No. 2 bundles	18.00-19.00
No. 1 busheling	30.00-31.00
Machine shop turnings	8.00-9.00
Mixed borings, turnings	10.00-11.00
Short shovel turnings	10.00-11.00
Punchings & plate	30.00-31.00

Cast Iron Grades

No. 1 cupola	*42.00-43.00*
Stove plate	*35.00-36.00*
Charging box cast	*36.00-37.00*
Heavy breakable	*33.00-34.00*
Unstripped motor blocks	*18.00-19.00*
Clean auto cast	*44.00-45.00*

SEATTLE

No. 1 heavy melting	30.00†
No. 2 heavy melting	28.00†
No. 1 bundles	22.00†
No. 2 bundles	20.00†
Machine shop turnings	9.00-10.00†
Mixed borings, turnings	9.00-10.00†
Electric furnace No. 1	38.00†

Cast Iron Grades

No. 1 cupola	31.00†
Heavy breakable cast	28.00†
Unstripped motor blocks	23.00†
Stove plate (f.o.b. plant)	21.00†

LOS ANGELES

No. 1 heavy melting	32.00
No. 2 heavy melting	30.00
No. 1 bundles	28.00
No. 2 bundles	17.00
Machine shop turnings	11.00
Shoveling turnings	13.00
Cast iron borings	13.00
Cut structurals and plate 1 ft and under	45.00

Cast Iron Grades (F.o.b. shipping point)

No. 1 cupola	39.00

Railroad Scrap

No. 1 R.R. heavy melt.	32.00

SAN FRANCISCO

No. 1 heavy melting	32.00
No. 2 heavy melting	30.00
No. 1 bundles	30.00
No. 2 bundles	22.00
Machine shop turnings	15.00
Mixed borings, turnings	15.00
Cast iron borings	15.00
Heavy turnings	15.00
Short shovel turnings	15.00
Cut structurals, 3 ft	40.00

Cast Iron Grades

No. 1 cupola	44.00
Charging box cast	34.00
Stove plate	34.00
Heavy breakable cast	28.00
Unstripped motor blocks	31.00
Clean auto cast	40.00
Drop broken machinery	40.00
No. 1 wheels	34.00

HAMILTON, ONT.

No. 1 heavy melting	30.00
No. 2 heavy melting	26.00
No. 1 bundles	30.00
No. 2 bundles	23.00
Mixed steel scrap	25.00
Mixed borings, turnings	15.00
Busheling, new factory:	
Prepared	30.00
Unprepared	24.00
Short steel turnings	19.00

Cast Iron Grades‡

No. 1 machinery cast	45.00-50.00

*Brokers' buying price.
†Nominal.
‡F.o.b. Hamilton, Ont.

S-E-G-R-E-G-A-T-E-D SCRAP IS WORTH MORE

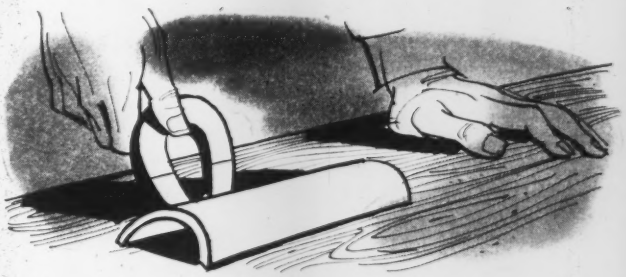
Here is how to test for STAINLESS STEEL TYPES 430 and 446

Last year, Types 430 and 446 accounted for the largest tonnage of all the stainless steel produced. The automobile industry alone consumed most of the 246,000 ton production of 430, the basic 17% chromium stainless steel, and expects to use even more for trim and transmission parts on future models. Additional applications in building, aviation, chemical processing and the production of heat resisting components for furnaces indicate increased demand, particularly for Type 430.

This expanding market for special steels requires more and more scrap of known analysis. This is where we can help you. Our personnel, equipment, experience and strategically located facilities are specifically geared to fulfill present and future needs for dependably segregated alloy scrap. We welcome your inquiry.

Rub specimen with emory paper to obtain clean surface.

Add 1 drop of 10% hydrochloric acid and let react for 1 minute. Add 1 drop of 10% potassium ferricyanide solution. After 30 seconds if dark green to blue color appears sample belongs to iron alloy group.



Add 1 drop of concentrated sulphuric acid and let react for 1 minute. If there is no attack or slight reaction test with magnet. If the results are definitely magnetic, sample is probably either STAINLESS TYPE 430 or 446.

Luria Brothers and Company, Inc.

MAIN OFFICE • PHILADELPHIA NATIONAL BANK BUILDING, PHILADELPHIA 7, PENNSYLVANIA

BRANCH OFFICES • BIRMINGHAM, ALA. • BOSTON, MASS. • BUFFALO, N. Y. • CHICAGO, ILLINOIS • CINCINNATI, OHIO • CLEVELAND, OHIO • DETROIT, MICHIGAN • HOUSTON, TEXAS • KOKOMO, INDIANA • LEBANON, PENNA. • LOS ANGELES, CAL. • MEMPHIS, TENN. • NEW YORK, N.Y. • PITTSBURGH, PENNA. • PHILADELPHIA, PENNA. • PUEBLO, COLORADO • READING, PENNA. • ST. LOUIS, MISSOURI • SAN FRANCISCO, CALIF. • SEATTLE, WASH. • *In Canada* • MONTREAL, QUEBEC—HAMILTON, ONTARIO

PLANTS • LEBANON, PENNA. • READING, PENNA. • MODENA, PENNA. • DETROIT (ECORSE), MICHIGAN • PITTSBURGH, PENNA. • ERIE, PENNA.

IMPORT & EXPORT—LIVINGSTON & SQUTHARD, INC., 99 Park Ave., New York, N.Y. • Cable Address FORENTRACO

Most Prices Continue Up

Primary copper rises 1 cent to 27.5 cents a pound, lead 0.5 cent to 13 cents. Further advances probable in lead, zinc, and copper. Aluminum industry hikes output

Nonferrous Metal Prices, Pages 320 & 321

NONFERROUS PRICES continue to rush upward. Primary copper and lead are the latest metals to get price boosts—and the end to the price advance is not yet in sight.

Copper — Phelps Dodge Corp. bumped the primary copper price by 1 cent to 27.5 cents a pound on Oct. 13 and was followed immediately by Kennecott Copper Corp. The third member of the "Big Three," Anaconda Co., matched the quotations the next day. Brass and wire mill prices have been hiked proportionately by all producers.

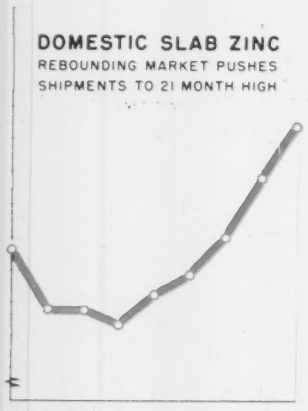
Heavy pressures to raise primary copper had been felt for several weeks. Demand has been steadily advancing since July vacations and has reached the fastest pace of the year. Strikes in Africa, Canada, and the U. S. (which show no sign of early settlement) have shut off output which normally would add up to 610,000 tons annually. Both factors have caused tight supplies overseas.

Custom smelters, more sensitive to market fluctuations than producers, are now quoting 1 cent a pound over the primary price (they raised it again on Oct. 15). Other prices are up: The London Metal Exchange was quoting 29.81 cents a pound on Oct. 14 and had been over 30 cents a few days before. Katanga is up to 28.80 cents.

All signs point to further increases in copper. Look for custom smelters to go up at any time. Primary producers could easily hike quotations another 0.5 to 1 cent a pound before long. Settlement of the strikes might take some of the steam out of another hike.

Lead—Continued good sales and less metal coming into the U. S. from other countries triggered the fourth lead price rise in two weeks on Oct. 14. The new price: 13 cents a pound, New York. Lead may go higher but probably not right away.

Zinc—Don't be surprised if the zinc price goes up another 0.5 cent to 11.5 cents a pound (East St. Louis). Such a move seems assured



if sales continue to move along at the present clip.

Silver—This price didn't move up from January until Sept. 26. Since then, prices have been advanced four times, placing the quotation at 90.375 cents an ounce on Oct. 15. Reason: Increasing demand has lowered supplies. Look for silver to edge up more, probably to 90.5 cents an ounce, since domestic silver becomes available at that figure.

Fourth Quarter Outlook

Here's how the fourth quarter picture shapes up for four other metals:

Titanium—This is one of the few metals that hasn't experienced an upswing. Shipments of mill products hit 1.37 million lb in the first quarter, 1.26 million lb in the second, and 1.11 million lb in the third. Expectations are fourth quarter shipments will be around 1.2 million lb.

Nickel—Some pickup was noted in the third quarter. Demand is running better than it has all year. Producers credit this to the general business upswing and their belief most customer inventories have been pretty well worked off. Look for continued improvement in sales with prices remaining stable.

The strike goes on at International Nickel Co. mines, but the company says it has a six months' supply of nickel in inventory.

Magnesium—Fourth quarter production of magnesium should pretty much parallel the third quarter's output of 10.8 million lb. Dow Chemical Co. says that national consumption, however, is running close to 18 million lb per quarter, which means customers are reducing inventories at the rate of 7.2 million lb every three months.

An upswing in demand should come from aircraft, missile, and military uses, and from companies needing the metal for tooling plate applications and cathodic protection.

NONFERROUS PRICE RECORD

	Price Oct. 15	Last Change	Previous Price	Sept. Avg	Aug. Avg	Oct., 1957 Avg
Aluminum	24.70	Aug. 1, 1958	24.00	24.700	24.700	26.000
Copper	27.50-28.50	Oct. 15, 1958	27.50	26.428	26.510	26.361
Lead	12.80	Oct. 14, 1958	12.30	10.730	10.646	13.504
Magnesium	35.25	Aug. 13, 1956	33.75	35.250	35.250	35.250
Nickel	74.00	Dec. 6, 1956	64.50	74.000	74.000	74.000
Tin	96.25	Oct. 15, 1958	95.875	94.120	94.995	91.843
Zinc	11.00	Oct. 8, 1958	10.50	10.000	10.000	10.000

Quotations in cents per pound based on: COPPER, mean of primary and secondary, deld. Conn. Valley; LEAD, common grade, deld. St. Louis; ZINC, prime western, E. St. Louis; TIN, Straits, deld. New York; NICKEL, electrolytic cathodes, 99.9%, base size at refinery, unpacked; ALUMINUM, primary pig, 99.5+%, f.o.b. shipping point; MAGNESIUM, pig, 99.8%, Velasco, Tex.

Now! From GENERAL CHEMICAL... *Leader in HF Production*

AQUEOUS HF IN NEW, SAFER "DRUM-WITHIN-A-DRUM"

Development of a safer container for Aqueous Hydrofluoric Acid (70% HF) has long been an important objective of chemical packaging specialists. Now General Chemical offers Aqueous HF in a new, safer "drum-within-a-drum" which combines the advantages of polyethylene and steel. Developed after more than two years of testing, this drum offers many important features:

Requires no venting! The new drum entirely eliminates venting, since there is no acid-to-steel contact. The all-steel drum presents possibility of danger from hydrogen pressure unless venting is done frequently and regularly.

No corrosion or leakage! One-piece polyethylene construction of inner drum cannot corrode or leak even during long periods of storage. The HF-resistant "poly" drum is fixed firmly inside its steel overpack.

Polyethylene closure seals tightly without "freezing"! Both bung opening and plug are acid-resistant polyethylene. The specially-constructed closure is exceptionally tight, yet simple to operate . . . eliminates "frozen" closures.

Lower tare weight! The new drum is much lighter than the all-steel container. The 30-gallon size, for example, carries 260 pounds of 70% HF with tare weight of only 40 pounds.

General Chemical is the nation's leading producer of hydrofluoric acid. Producing Works are located at Baton Rouge, La.; North Claymont, Del.; and Nitro, W. Va. Additional packaging locations at Buffalo, Chicago, Cleveland, Pittsburgh, and El Segundo (Calif.)

Telephone or write your nearest General Chemical office listed below for further information or service.

Basic Chemicals for American Industry

Allied Chemical

GENERAL CHEMICAL DIVISION

40 Rector Street, New York 6, N. Y.

Offices: Albany • Atlanta • Baltimore • Birmingham • Boston • Bridgeport • Buffalo • Charlotte • Chicago • Cincinnati • Cleveland (Miss.) • Cleveland (Ohio) Denver • Detroit • Houston • Jacksonville • Kalamazoo • Los Angeles • Milwaukee • Minneapolis • New York • Philadelphia • Pittsburgh • Portland (Ore.) Providence • San Francisco • St. Louis • Seattle • Kennewick, Vancouver and Yakima (Wash.)

Nonferrous Metals

Cents per pound, carlots except as otherwise noted.

PRIMARY METALS AND ALLOYS

Aluminum: 99.5%, pigs, 24.70; ingots, 26.80, 30,000 lb or more, f.o.b. shipping point. Freight allowed on 500 lb or more.

Aluminum Alloy: No. 13, 28.60; No. 43, 28.40; No. 195, 29.40; No. 214, 30.20; No. 356, 28.60; 30 or 40 lb ingots.

Antimony: R.M.M. brand, 99.5%, 29.00; Lone Star brand, 29.50, f.o.b. Laredo, Tex., in bulk. Foreign brands, 99.5%, 23.50-24.50, New York, duty paid, 10,000 lb or more.

Beryllium: 97% lump or beads, $71.50 per lb, f.o.b. Cleveland or Reading, Pa.

Beryllium Aluminum: 5% Be, $74.75 per lb of contained Be, with balance as Al at market price, f.o.b. shipping point.

Beryllium Copper: 3.75-4.25% Be, $43 per lb of contained Be, with balance as Cu at market price on shipment date, f.o.b. shipping point.

Bismuth: $2.25 per lb, ton lots.

Cadmium: Sticks and bars, $1.45 per lb deld.

Cobalt: 97.99%, $2.00 per lb for 550-lb keg; $2.02 per lb for 100 lb case; $2.07 per lb under 100 lb.

Columbium: Powder, $55-85 per lb, nom.

Copper: Electrolytic, 27.50 deld.; custom smelters, 28.50; lake, 27.50 deld.; fire refined, 27.25 deld.

Germanium: First reduction, $179.17-197.31 per lb; intrinsic grade, $197.31-220 per lb, depending on quantity.

Gold: U. S. Treasury, $35 per oz.

Indium: 99.9%, $2.25 per troy oz.

Iridium: $70-80 nom. per troy oz.

Lead: Common, 12.80; chemical, 12.90; corroding, 12.90, St. Louis. New York basis, add 0.20.

Lithium: 98 + %, 50-100 lb. cups or ingots, $12; rod, $15; shot or wire, $16. 100-500 lb. cups or ingots, $10.50; rod, $14; shot or wire, $15, f.o.b. Minneapolis.

Magnesium: Pig, 35.25; ingot, 36.00 f.o.b. Velasco, Tex.; 12 in. sticks, 59.00 f.o.b. Madison, Ill.

Magnesium Alloys: AZ91A (diecasting), 40.75 deld.; AZ63A, AZ92A, AZ91C (sand casting), 40.75, f.o.b. Velasco, Tex.

Mercury: Open market, spot, New York, $236-239 per 76-lb flask.

Molybdenum: Unalloyed, turned extrusions, 3.75-5.75 in. round, $9.60 per lb in lots of 2500 lb or more, f.o.b. Detroit.

Nickel: Electrolytic cathodes, sheets (4 x 4 in. and larger), unpacked, 74.00; 10-lb pigs, unpacked, 78.25; "NX" nickel shot, 79.50; "F" nickel shot for addition to cast iron, 74.50; "F" nickel, 5 lb ingots in kegs for addition to cast iron, 75.50. Prices f.o.b. Port Colborne, Ont., including import duty. New York basis, add 1.01. Nickel oxide sinter at Buffalo, New York, or other established U. S. points of entry, contained nickel, 69.60.

Osmium: $70-100 per troy oz nom.

Palladium: $15-17 per troy oz.

Platinum: $57-60 per troy oz from refineries.

Radium: $16-21.50 per mg radium content, depending on quantity.

Rhodium: $118-125 per troy oz.

Ruthenium: $15-55 per troy oz.

Selenium: $7.00 per lb, commercial grade.

Silver: Open market, 90.375 per troy oz.

Sodium: 17.00 c.l.; 19.00-19.50 l.c.l.

Tantalum: Rod, $60 per lb; sheet, $55 per lb.

Tellurium: $1.65-1.85 per lb.

Thallium: $7.50 per lb.

Tin: Straits, N. Y., spot, 96.25; prompt, 96.125.

Titanium: Sponge, 99.3 + % grade A-1, ductile (0.3% Fe max.), $1.82-2.05; grade A-2 (0.5% Fe max.), $1.70-1.85 per lb.

Tungsten: Powder, 89.8%, carbon reduced, 1000-lb lots, $3.15 per lb nom., f.o.b. shipping point; less than 1000 lb, add 15.00; 99 + % hydrogen reduced, $3.30-3.80.

Zinc: Prime Western, 11.00; brass special, 11.25; intermediate, 11.50, East St. Louis, freight allowed over 0.50 per lb. New York basis, add 0.50. High grade, 12.00; special high grade, 12.25 deld. Diecasting alloy ingot No. 3, 13.50; No. 2, 13.75; No. 5, 13.50 deld.

Zirconium: Reactor grade sponge, 100 lb or less, $7 per lb; 100-500 lb, $6.50 per lb; over 500 lb, $6 per lb.

(Note: Chromium, manganese, and silicon metals are listed in ferroalloy section.)

SECONDARY METALS AND ALLOYS

Aluminum Ingot: Piston alloys, 23.50-25.25; No. 12 foundry alloy (No. 2 grade), 21.50-22.00; 5% silicon alloy, 0.60 Cu max., 24.75-25.00; 13 alloy 0.60 Cu max., 24.75-25.00; 195 alloy, 25.25-26.00; 108 alloy, 22.25-22.50. Steel deoxidizing grades, notch bars, granulated or shot: Grade 1, 22.75; grade 2, 21.50; grade 3, 20.50; grade 4, 18.00.

Brass Ingot: Red brass, No. 115, 29.00; tin bronze, No. 225, 38.00; No. 245, 32.75; high-leaded tin bronze, No. 305, 33.25; No. 1 yellow, No. 405, 24.00; manganese bronze, No. 421, 25.75.

Magnesium Alloy Ingot: AZ63A, 37.50; AZ91B, 37.50; AZ91C, 41.25; AZ92A, 37.50.

NONFERROUS PRODUCTS

BERYLLIUM COPPER

(Base prices per lb, plus mill extras, 2000 to 5000 lb; nom. 1.9% Be alloy.) Strip, $1.87, f.o.b. Temple, Pa., or Reading, Pa.; rod, bar, wire, $1.85, f.o.b. Temple, Pa.

COPPER WIRE

Bare, soft, f.o.b. eastern mills, 20,000-lb lots, 32.855; l.c.l., 33.48. Weatherproof, 20,000-lb lots, 34.41; l.c.l., 35.16, before quantity discounts.

LEAD

(Prices to jobbers, f.o.b. Buffalo, Cleveland, Pittsburgh.) Sheets, full rolls, 140 sq ft or more, $18.50 per cwt; pipe, full coils, $18.50 per cwt; traps and bends, list prices plus 30%.

TITANIUM

(Prices per lb, 10,000 lb and over, f.o.b. mill.) Sheets and strip, $8.50-15.95; sheared mill plate, $6.00-9.50; wire, $6.50-11.00; forging billets, $4.10-4.35; hot-rolled and forged bars, $5.25-6.35.

ZINC

(Prices per lb, c.l., f.o.b. mill.) Sheets, 24.00; ribbon zinc in coils, 20.50; plates, 19.00.

ZIRCONIUM

Plate, $12.50-19.20; H.R. strip, $12.50-22.90; C.R. strip, $15.90-31.25; forged or H.R. bars, $11.00-17.40.

NICKEL, MONEL, INCONEL

	"A" Nickel	Monel	Inconel
Sheets, C.R.	126	106	128
Strip, C.R.	124	108	138
Plate, H.R.	120	105	121
Rod, Shapes, H.R.	107	88	109
Seamless Tubes	157	129	200

ALUMINUM

Sheets: 1100, 3003, and 5005 mill finish (30,000 lb base; freight allowed).

Thickness Range, Inches	Flat Sheet	Coiled Sheet
0.250-0.136	42.80-47.30	.....
0.136-0.096	43.20-48.30	.....
0.126-0.103	.....	39.20-39.80
0.096-0.077	43.80-50.00	39.30-40.00
0.077-0.068	44.30-52.20	.....
0.077-0.061	.....	39.50-40.70
0.068-0.061	44.30-52.20	.....
0.061-0.048	44.90-54.40	40.10-41.80
0.048-0.038	45.40-57.10	40.60-43.20
0.038-0.030	45.70-62.00	41.00-45.70
0.030-0.024	46.20-53.70	41.30-45.70
0.024-0.019	46.90-56.80	42.40-44.10
0.019-0.017	47.70-54.10	43.00-44.70
0.017-0.015	48.60-55.00	43.80-45.50
0.015-0.014	49.60	44.80-46.50
0.014-0.012	50.80	45.50
0.012-0.011	51.80	46.70
0.011-0.0095	53.50	48.10
0.0095-0.0085	54.60	49.60
0.0085-0.0075	56.20	50.80
0.0075-0.007	57.70	52.30
0.007-0.006	59.30	53.70

ALUMINUM (continued)

Plates and Circles: Thickness 0.250-3 in. 24-60 in. width or diam., 72-240 in. lengths.

Alloy	Plate Base	Circle Base
1100-F, 3003-F	42.40	47.20
5050-F	43.50	48.30
3004-F	44.50	50.20
5052-F	45.10	50.90
6061-T6	45.60	51.70
2024-T4	49.30	56.10
7075-T6*	57.60	64.70

*24-48 in. width or diam., 72-180 in. lengths.

Screw Machine Stock: 30,000 lb base.

Diam. (in.) or across flats*	Round 2011-T3	Round 2017-T4	Hexagonal 2011-T3	Hexagonal 2017-T4
0.125	76.90	73.90	....	....
0.250	62.00	60.20	89.10	76.60
0.375	61.20	60.00	73.50	68.50
0.500	61.20	60.00	73.50	68.50
0.625	61.20	60.00	69.80	64.20
0.750	59.70	58.40	63.60	60.40
0.875	59.70	58.40	63.60	60.40
1.000	59.70	58.40	63.60	60.40
1.125	57.30	56.10	61.50	58.30
1.250	57.30	56.10	61.50	58.30
1.375	57.30	56.10	61.50	58.30
1.500	57.30	56.10	61.50	58.30
1.625	55.00	53.60	....	56.20
1.750	55.00	53.60	60.30	56.20
1.875	55.00	53.60	....	56.20
2.000	55.00	53.60	60.30	56.20
2.125	53.50	52.10	....	....
2.250	53.50	52.10	....	56.20
2.375	53.50	52.10	....	....
2.500	53.50	52.10	....	56.20
2.625	....	50.40	....	....
2.750	51.90	50.40	....	56.20
2.875	....	50.40	....	....
3.000	51.90	50.40	....	56.20
3.125	....	50.40	....	....
3.250	....	50.40	....	....
3.375	....	50.40	....	....

*Selected sizes.

Forging Stock: Round, Class 1, random lengths, diam. 0.375-8 in., "F" temper; 2014, 42.20-55.00; 6061, 41.60-55.00; 7075, 61.60-75.00; 7070, 66.60-80.00.

Pipe: ASA schedule 40, alloy 6063-T6 standard lengths, plain ends, 90,000 lb base, dollars per 100 ft. Nominal pipe sizes: ¾ in., 18.85; 1 in., 29.75; 1¼ in., 40.30; 1½ in., 48.15; 2 in., 58.30; 4 in., 160.20; 6 in., 287.55; 8 in., 432.70.

Extruded Solid Shapes:

Factor	Alloy 6063-T5	Alloy 6062-T6
9-11	42.70-44.20	51.30-55.50
12-14	42.70-44.20	52.00-56.50
15-17	42.70-44.20	53.20-58.20
18-20	43.20-44.70	55.20-60.80

MAGNESIUM

Sheet and Plate: AZ31B standard grade, 0.32 in., 103.10; .081 in., 77.90; .125 in., 70.40; .188 in., 69.00; .250-2.0 in., 67.90. AZ31B spec. grades, .032 in., 171.30; .081 in., 108.70; .125 in., 98.10; .188 in., 95.70; .250-2.00 in., 93.30. Tread plate, 60-192 in. lengths, 24-72 in. widths; .125 in., 74.90; .188 in., 71.70-72.70; .25-.75 in., 70.60-71.60. Tooling plate, .25-.30 in., 73.00.

Extruded Solid Shapes:

Factor	Com. Grade (AZ31C)	Spec. Grade (AZ31B)
6-8	69.60-72.40	81.60-87.40
12-14	70.70-73.00	85.70-88.00
24-26	75.60-76.30	90.60-91.30
36-38	89.20-90.30	104.20-105.30

NONFERROUS SCRAP

DEALER'S BUYING PRICES

(Cents per pound, New York, in ton lots.)

Copper and Brass: No. 1 heavy copper and wire, 21.75-22.25; No. 2 heavy copper and wire, 20.00-20.50; light copper, 18.00-18.50; No. 1 composition red brass, 17.25-17.75; No. 1 com-

BRASS MILL PRICES

	MILL PRODUCTS a				SCRAP ALLOWANCES e (Based on copper at 27.50c)		
	Sheet, Strip, Plate	Rod	Wire	Seamless Tubes	Clean Heavy	Rod Ends	Clean Turnings
Copper	50.63b	47.86c	....	50.82	23.500	23.500	22.750
Yellow Brass	44.57	30.30d	45.11	47.48	18.000	17.750	16.250
Low Brass, 80%	47.03	46.97	47.57	49.84	20.000	19.750	19.250
Red Brass, 85%	47.89	47.83	48.43	50.70	20.750	20.500	20.000
Com. Bronze, 90%	49.30	49.23	49.84	51.86	21.625	21.375	20.875
Manganese Bronze	52.53	46.76	57.20	....	16.875	16.625	16.000
Muntz Metal	46.95	42.76	....	....	16.875	16.625	16.125
Naval Brass	48.84	43.15	55.90	52.00	16.625	16.375	15.875
Silicon Bronze	55.33	54.52	55.37	73.01	23.125	22.875	22.125
Nickel Silver, 10%	59.72	62.05	62.05	....	22.875	....	....
Phos. Bronze, A-5%	69.67	70.17	70.17	71.35	24.375	24.125	23.125

a. Cents per lb, f.o.b. mill; freight allowed on 500 lb or more. b. Hot-rolled. c. Cold-drawn. d. Free cutting. e. Prices in cents per lb for less than 20,000 lb, f.o.b. shipping point. On lots over 20,000 lb at one time, of any or all kinds of scrap, add 1 cent per lb.

position turnings, 16.25-16.75; new brass clippings, 14.75-15.25; light brass, 10.50-11.00; heavy yellow brass, 12.75-13.25; new brass rod ends, 12.75-13.25; auto radiators, unsweated, 13.50-14.00; cocks and faucets, 13.75-14.25; brass pipe, 14.25-14.75.

Lead: Heavy, 8.50-9.00; battery plates, 4.75-5.25; linotype and stereotype, 10.50-11.00; electrotype, 9.50-10.00; mixed babbitt, 9.50-10.00.

Monel: Clippings, 32.00-34.00; old sheets, 26.00-28.00; turnings, 20.00-23.00; rods, 32.00-34.00.

Nickel: Sheets and clips, 52.00-55.00; rolled anodes, 52.00-55.00; turnings, 37.00-40.00; rod ends, 52.00-55.00.

Zinc: Old zinc, 4.00-4.25; new diecast scrap, 3.75-4.00; old diecast scrap, 2.50-2.75.

Aluminum: Old castings and sheets, 9.25-9.75; clean borings and turnings, 6.25-6.75; segregated low copper clips, 13.00-13.50; segregated high copper clips, 12.00-12.50; mixed low copper clips, 12.75-13.25; mixed high copper clips, 11.50-12.00.

(Cents per pound, Chicago)

Aluminum: Old castings and sheets, 11.00-11.50; clean borings and turnings, 10.00-10.50; segregated low copper clips, 16.50-17.00; segregated high copper clips, 15.50-16.00; mixed low copper clips, 16.00-16.50; mixed high copper clips, 15.00-15.50.

(Cents per pound, Cleveland)

Aluminum: Old castings and sheets, 10.50-11.00; clean borings and turnings, 9.50-10.00; segregated low copper clips, 14.50-15.00; segregated high copper clips, 13.00-13.50; mixed low copper clips, 14.00-14.50; mixed high copper clips, 12.50-13.00.

REFINERS' BUYING PRICES

(Cents per pound, carlots, delivered refinery)

Beryllium Copper: Heavy scrap, 0.020-in. and heavier, not less than 1.5% Be, 53.50; light scrap, 48.50; turnings and borings, 33.50.

Copper and Brass: No. 1 heavy copper and wire, 22.00 nom.; No. 2 heavy copper and wire, 21.25 nom.; light copper, 19.00 nom.; refinery brass (60% copper) per dry copper content, 21.25.

INGOTMAKERS' BUYING PRICES

Copper and Brass: No. 1 heavy copper and wire, 22.00 nom.; No. 2 heavy copper and wire, 21.25 nom.; light copper, 19.00 nom.; No. 1 composition borings, 20.50; No. 1 composition solids, 21.00; heavy yellow brass solids, 15.00; yellow brass turnings, 14.00; radiators, 17.50.

PLATING MATERIALS

(F.o.b. shipping point, freight allowed on quantities)

ANODES

Cadmium: Special or patented shapes, $1.45.

Copper: Flat-rolled, 44.29; oval, 42.50, 5000-10,000 lb; electrodeposited, 35.75, 2000-5000 lb lots; cast, 38.25, 5000-10,000 lb quantities.

Nickel: Depolarized, less than 100 lb, 114.25; 100-499 lb, 112.00; 500-4999 lb, 107.50; 5000-29,999 lb, 105.25, 30,000 lb, 103.00. Carbonized, deduct 3 cents a lb.

Tin: Bar or slab, less than 200 lb, 114.50; 200-499 lb, 113.00; 500-999 lb, 112.50; 1000 lb or more, 112.00.

Zinc: Balls, 17.50; flat tops, 17.50; flats, 20.25; ovals, 19.50, ton lots.

CHEMICALS

Cadmium Oxide: $1.45 per lb in 100-lb drums.

Chromic Acid (flake): 100-2000 lb, 31.00; 2000-10,000 lb, 30.50; 10,000-20,000 lb, 30.00; 20,000 lb or more, 29.50.

Copper Cyanide: 100-200 lb, 65.90; 300-900 lb, 63.90; 1000-19,900 lb, 61.90.

Copper Sulphate: 100-1900 lb, 14.30; 2000-5900 lb, 12.30; 6000-11,900 lb, 12.05; 12,000-22,900 lb, 11.80; 23,000 lb or more, 11.30.

Nickel Chloride: 100 lb, 45.00; 200 lb, 43.00; 300 lb, 42.00; 400-4900 lb, 40.00; 5000-9900 lb, 38.00; 10,000 lb or more, 37.00.

Nickel Sulphate: 5000-22,000 lb, 29.00; 23,000-35,900 lb, 28.50; 36,000 lb or more, 28.00.

Sodium Cyanide (Cyanobrik): 200 lb, 20.80; 400-800 lb, 19.80; 1000-19,800 lb, 18.80; 20,000 lb or more, 17.30.

Sodium Stannate: Less than 100 lb, 76.30; 100-600 lb, 67.20; 700-1900 lb, 64.50; 2000-9900 lb, 62.60; 10,000 lb or more, 61.30.

Stannous Chloride (anhydrous): 25 lb, 151.40; 100 lb, 146.50; 400 lb, 144.00; 800-19,900 lb, 103.20; 20,000 lb or more, 97.10.

Stannous Sulphate: Less than 50 lb, 136.70; 50 lb, 106.70; 100-1900 lb, 104.70; 2000 lb or more, 102.70.

Zinc Cyanide: 100-200 lb, 59.00; 300-900 lb, 57.00.

(*Concluded from Page 315*)

that of Pittsburgh Steamship Div., U. S. Steel Corp. As soon as final hauls have been made, the 26 will proceed to various ports for winter lay-up. The remaining vessels of the fleet will continue in service through Nov. 16.

Tin Plate . . .

Tin Plate Prices, Page 306

October will be an active tin plate shipping month with canmakers taking substantial tonnages to beat the Nov. 1 price increase. Movement in the latter part of fourth quarter, though, will be slow.

Stocks of plates in the hands of producers will be virtually nonexistent by Nov. 1. Consequently, dull demand in November and December will permit them to rebuild their inventories leisurely.

STRUCTURAL SHAPES . . .

STRUCTURAL STEEL PLACED

2650 tons, seven highway structures and pavement section, Naugatuck, Conn., to City Iron Works Inc., Wethersfield, Conn.; Brunalli Construction Co., Southington, Conn., general contractor; also 700 tons, steel piles, to Bethlehem Steel Co., Bethlehem, Pa.

800 tons, Montana state highway bridge, Superior County, to unnamed interests.

395 tons, two I-beam bridges, Yarmouth, Maine, to Bancroft & Martin Rolling Mills Co., South Portland, Maine; W. H. Hinman Inc., North Anson, Maine, general contractor.

370 tons, state highway bridge, Winslow, Maine, to Bancroft & Martin Rolling Mills Co., South Portland, Maine; Ellis C. Snodgrass Inc., Portland, Maine, general contractor.

285 tons, factory building for Edwin J. Schoettle Inc., Bucks County, Pennsylvania, to Camden Iron Works, Camden, N. J., through the architect.

275 tons, angles, medium black, General Stores Supply Office, Navy, Philadelphia, to Knoxville Iron Co., Knoxville, Tenn.

165 tons, medium black, Grade M channels, General Stores Supply Office, Navy, Philadelphia, to Bethlehem Steel Co., Bethlehem, Pa.

150 tons, gates and facilities, Oxbow Dam, Snake River, to unnamed fabricator by Idaho Power Co., Boise, Idaho.

135 tons, medium black, angles, General Stores Supply Office, Navy, Philadelphia, to Columbia-Geneva Steel Div. U. S. Steel Corp., San Francisco.

113 tons (also 44 tons of reinforcing to Bethlehem Pacific Coast Steel Corp., Seattle) cafeteria and exchange building, Elmendorf Air Base, Alaska, to Isaacson Iron Works, Seattle; Lease Co. Inc., Seattle, general contractor.

110 tons, including reinforcing bars, I-beam bridge, Augusta, Maine, to Bancroft & Martin Rolling Mills Co., South Portland, Maine; H. E. Sargent Inc., Stillwater, Maine, general contractor.

STRUCTURAL STEEL PENDING

2890 tons, state bridgework, LR 1026 IA, Allegheny County, Pennsylvania, bids Oct. 30; 625 tons of reinforcing bars also required.

745 tons, T-bar stock, cut from medium and high tensile I-beams, naval shipyard, Bremerton, Wash.; bids Oct. 31.

500 tons or more, superstructure, 2300-ft Peace River bridge, Alaska highway, in British Columbia; Dominion Bridge Co., Barnaby, B. C., low at $2,658,000 to Secretary of Defense, Ottawa, Ont.

378 tons, state bridgework, Dauphin County, Pennsylvania, bids Oct. 30; 187 tons of reinforcing bars also required.

330 tons, also 115 tons of reinforcing, Washington State highway span, Adams County; general contract to C. E. Oneal, Ellensburg, Wash., low at $768,317.

174 tons, also 50 tons of reinforcing bars, Washington State highway span, Skagit County, Neukirch Bros., Seattle, low at $256,444.

Unstated, also 1400 ft steel piling and 25 tons of reinforcing, Sitka highway bridge, Alaska; A. & R. Builders Inc., Seattle, low at $82,329 to Bureau of Public Roads, Juneau, Alaska.

CLASSIFIED

PERSONNEL WANTED
for
SMALL MERCHANT & RE-BAR ROLLING MILL AND MELT PLANT

Mill now being built in Fairbanks, Alaska, and will be in operation in April, 1959. Mill will roll mainly reinforcing bars and will produce during the months of April through October, but key personnel will be compensated on an annual basis.

Personnel inquiries requested for melters, chemists, rollers, superintendents, managers and lesser related positions. Please enclose full particulars, including picture and reference, in first letter to

ALASKA STEEL MILLS, INC.
7707-7th Ave. So.
Seattle, Washington

MOTORS • GENERATORS
TRANSFORMERS
NEW • REBUILT
ELECTRIC EQUIPMENT CO.

WORLD'S LARGEST INVENTORY
CALL COLLECT GL 3-6783
P. O. BOX 51 • ROCHESTER 1, N. Y.

WANTED

METAL PRODUCTS TO MANUFACTURE

Large, well equipped, well capitalized, sheet metal, light plate and structural shop is seeking assemblies or subassemblies to manufacture.

Plant has 170,000 sq. ft. of floor space and is centrally located in highly industrialized area. Equipment for square and rotary shearing, stamping (presses up to 200 tons), rolling, brake-forming, spot and seam-welding, manual arc, heliarc, sigma and unimelt welding, angle tube and bar forming, spray or dip painting, adequate packing and rail facilities available.

Practically no physical limitations as to length, height or weight of product. **WRITE BOX NO. 690, STEEL, PENTON BLDG., CLEVELAND 13, OHIO.**

TO
FIND
THE MAN
YOU NEED...

Place an advertisement in the "Help Wanted" columns of STEEL's classified pages. Your advertisement will reach the qualified men you need, because STEEL is addressed to highly-trained men in all phases of metalworking

STEEL
The Metalworking Weekly

Advertising Index

Abell-Howe Co. 271
Acme Steel Products Division, Acme Steel Co. 48
Acro Welder Mfg. Co. 323
Aeroquip Corporation 262
Aetna-Standard Engineering Co., The ..... Inside Back Cover
Airaterra 248
Ajax Electric Co. 141
Ajax Engineering Corporation 229
Ajax Manufacturing Co., The 66
Alan Wood Steel Co. 184
Alaska Steel Mills, Inc. 321
Alco Products, Inc. 90, 91
Allegheny Ludlum Steel Corporation 59
Alliance Machine Co., The 42, 43
Allied Chemical Corporation, General Chemical Division 319
Allis-Chalmers, General Products Division ... 55
Allison-Campbell Division, American Chain & Cable 324
Allmetal Screw Products Co., Inc. 237
Aluminium Limited Sales, Inc. 134
Amchem Products, Inc. 285
American Cast Iron Pipe Co., Special Products Division 70
American Chain & Cable, Allison-Campbell Division 324
American Gas Association 106
American Optical Co., Safety Products Division 72
American Pulverizer Co. 225
American Roller Die Corporation 270
American Steel & Wire Division, United States Steel Corporation 74, 75, 113
American Steel Warehouse Association, Inc... 76
Anaconda Wire & Cable Co. 226, 227
Apex Machine & Tool Co., The 23
Armstrong Bros. Tool Co. 222
Aronson Machine Co. 78
Associated Spring Corporation 89
Atkins Saw Division, Borg-Warner Corporation 190
Aurora Equipment Co., Equipto Division .. 313
Avondale Marine Ways, Inc. 40

Babcock & Wilcox Co., The, Refractories Division 207
Baker, J. E., Co., The 224
Baldwin-Lima-Hamilton Corporation, Hamilton Division 155
Barber-Colman Co. 96, 97, 236
Barnes, Wallace, Co., The, Ltd., Division Associated Spring Corporation 89
Barnes, Wallace, Division, Associated Spring Corporation 89
Barnes, Wallace, Steel Division, Associated Spring Corporation 89
Bay State Abrasive Products Co. 80, 81
Bethlehem Steel Co. 1
B-G-R Division, Associated Spring Corporation 89
Binks Manufacturing Co. 219
Bishop, J., & Co. Platinum Works 250
Bliss & Laughlin 101
Bliss, E. W., Co., Mackintosh-Hemphill Division 51
Borg-Warner Corporation, Atkins Saw Division 190
Borg-Warner Corporation, Ingersoll Steel Division 93
Borg-Warner Industrial Cranes 218
Boston Gear Works 261
Brown & Sharpe Mfg. Co. 152
Browning, Victor R., & Co., Inc. 88
Buffalo Bolt Co. 153

Campbell Chain Co. 252
Carlson, G. O., Inc. 200
Carpenter Steel Co., The 82, 83
Central Foundry Division, General Motors Corporation 30, 31
Chase Brass & Copper Co. 311
Chicago Steel Service Co. 253
Cincinnati Lathe & Tool Co. 10
Cincinnati Milling Machine Co., The, Milling Machine Division 133
Coffing Hoist Division of Duff-Norton Co. .. 267
Colorado Fuel & Iron Corporation, The ..44, 105
Columbia-Geneva Steel Division, United States Steel Corporation 25, 26, 27, 74, 75, 113
Convair, Dynapak Division, A Division of General Dynamics Corporation 210, 211
Copperweld Steel Co., Aristaloy Steel Division 118
Copperweld Steel Co., Superior Steel Division 231
Cowles Tool Co. 254
Crucible Steel Company of America 73
Cullen-Friestedt Co. 254

De Laval Steam Turbine Co. 111
Detroit Stamping Co. 16
Detroit Steel Corporation 122
DoAll Co., The 244
Drop Forging Association 287
Duff-Norton Co., Coffing Hoist Division 267
Dunbar Brothers Division, Associated Spring Corporation 89
Du Pont, E. I., de Nemours & Co., Inc. 186, 187
Duraloy Co., The 216
Dykem Co., The 313
Dynapak Division of Convair, A Division of General Dynamics Corporation 210, 211

Easton Car & Construction Co. 233
Electric Equipment Co. 321
Electric Furnace Co., The 188
Electro Metallurgical Co., Division of Union Carbide Corporation 33
Electronic Control Systems Division of Stromberg-Carlson 77
Equipto Division of Aurora Equipment Co. .. 313
Esso Standard Oil Co. 156

Fate-Root-Heath Co., The, Plymouth Locomotive Works 124
Federal Bearings Co., Inc., The 22
Finkl, A., & Sons Co. 110
Foote Bros. Gear & Machine Corporation .. 209
Formed Steel Tube Institute 223
Formica Corporation 189
Frasse, Peter A., & Co., Inc. 56

Garlock Packing Co., The 65
Gates Rubber Co., The 286
Gear Specialties, Inc. 20, 21
General Chemical Division, Allied Chemical Corporation 319
General Dynamics Corporation, Dynapak Division of Convair 210, 211
General Electric Co. 46, 47, 212, 213, 214
General Electric Co., Metallurgical Products Department 108
General Motors Corporation, Central Foundry Division 30, 31
General Motors Corporation, Saginaw Steering Gear Division 100
Gerlinger Carrier Co. 34, 35
Gibson Division, Associated Spring Corporation 89
Great Lakes Steel Corporation 52, 53
Greenlee Bros. & Co. 208

Hamilton Division, Baldwin-Lima-Hamilton Corporation 155
Hamilton Foundry & Machine Co., The 204
Handy & Harman 146
Hansen Manufacturing Co., The 289
Harbison-Walker Refractories Co. 192, 193
Harnischfeger Corporation 264, 265
Harrington & King Perforating Co., Inc., The.. 309
Hassall, John, Inc. 145
Haynes Stellite Co., Division of Union Carbide Corporation 256
Heald Machine Co., The .... Inside Front Cover
Heresite & Chemical Co. 279
Hooker Chemical Corporation 277
Hoover Ball & Bearing Co. 195
Horsburgh & Scott Co., The 263
Hough, Frank G., Co., The 50
Houghton, E. F., & Co. 149
Hull, R. O., & Co., Inc. 296
Hyde Park Foundry & Machine Co. 255

Ingersoll-Rand 220, 221
Ingersoll Steel Division, Borg-Warner Corporation 93
Inland Steel Co. 243

Jessop Steel Co. 109
Johnson Bronze Co. 67
Jones & Lamson Machine Co. 98
Jones & Laughlin Steel Corporation, Stainless & Strip Division 79, 292

Kaiser Aluminum & Chemical Sales, Inc., Kaiser Chemicals Division 151
Kaiser Engineers Division of Henry J. Kaiser Co. 64
Kenco Manufacturing Co. 233
Keystone Steel & Wire Co. 115
Kinnear Mfg. Co., The 245
Kirk & Blum Manufacturing Co., The 269
Koppers Co., Inc. 68, 69

Lamson & Sessions Co., The 8, 9
Landis Machine Co. 45
Landis Tool Co. 17
Layne & Bowler Pump Co. 257
LeBlond, R. K., Machine Tool Co., The 4
Leeds & Northrup Co. 92
Lilly, Eli, & Co., Agricultural & Industrial Products Division 202, 203
Lincoln Electric Co., The 117
Lindberg Engineering Co., Gas Processing Division 13
Lindberg Industrial Corporation 14, 15
Link-Belt Co. 49
Lodge & Shipley Co., The 32
Loftus Engineering Corporation 299
Lord Baltimore Hotel 315
Luria Brothers & Co., Inc. 317

Mackintosh-Hemphill Division of E. W. Bliss Co. 51
Magnaflux Corporation 232
Magnethermic Corporation 112
Mallory-Sharon Metals Corporation 2
Manning, Maxwell & Moore, Inc., Shaw-Box Crane & Hoist Division 272
Manross, F. N., & Sons Division, Associated Spring Corporation 89
Marathon Specialty Steels, Inc. 314
Mattison Machine Works 29
Metal Treating Institute 99
Metallurgical Products Department of General Electric Co. 108
Micromatic Hone Corporation 238, 239
Miller Electric Manufacturing Co., Inc. 298
Milwaukee Division, Associated Spring Corporation 89
Moltrup Steel Products Co. 313
Monarch Machine Tool Co., The 18, 19
Morse Chain Co. 104
Morse Twist Drill & Machine Co. 36, 37

National Acme Co., The 62, 63
National Polymer Products, Inc. 84
National Steel Corporation 52, 53
National Tube Division, United States Steel Corporation 113
Niagara Blower Co. 185
Norton Co. 57, 58

Ohio Crankshaft Co., The 3
Ohio Division, Associated Spring Corporation 89

Pangborn Corporation 217
Pannier Corporation, The 309
Pennsalt Chemicals Corporation 290, 291
Philadelphia Gear Corporation 205
Pittsburgh Metallurgical Co., Inc. 197
Pittsburgh Steel Co. 102, 103
Plymouth Locomotive Works, The Fate-Root-Heath Co. 124
Pollock, William B., Co., The 85
Portage Machine Co., The 24
Potter & Johnston Co. 268
Production Machinery Corporation 61
Progressive Mfg. Co., The, Division of The Torrington Co. 314

Raymond Manufacturing Division, Associated Spring Corporation 89
Reading Crane & Hoist Corporation 284
Ready-Power Co., The 301
Republic Steel Corporation 38, 39
Rockford Machine Tool Co. 240, 241
Roebling's, John A., Sons Corporation, Subsidiary of The Colorado Fuel & Iron Corporation 44
Rogers Brothers Corporation 297
Rollway Bearing Co. 60
Rolock, Inc. 266
Ryerson, Joseph T., & Son, Inc. 121

Saginaw Steering Gear Division, General Motors Corporation 100
Sandvik Steel, Inc. 94
Scott Paper Co. 41
Seaboard Pacific Division, Associated Spring Corporation 89
Selas Corporation of America 282, 283
Shaw-Box Crane & Hoist Division, Manning, Maxwell & Moore, Inc. 272
Sheffield Corporation, The 7
Shenango Furnace Co., The, Centrifugally Cast Products Division 260
Shepard Niles Crane & Hoist Corporation 228
Signode Steel Strapping Co. 246, 247
Simonds Saw & Steel Co. 54
Stamco, Inc. 183
Standard Oil Co. (Indiana) 258, 259
Starrett, L. S., Co., The 71
Sterling National Industries, Inc. 222
Stromberg-Carlson, Electronic Control Systems Division 77
Sun Oil Co., Industrial Products Department 87
Sun Ship Building & Dry Dock Co. 281
Superior Steel Division of Copperweld Steel Co. 231
Superior Tube Co. 86
Surface Combustion Corporation 294

Tempil Corporation 144
Tennessee Coal & Iron Division, United States Steel Corporation 25, 26, 27, 74, 75, 113
Thomas Machine Manufacturing Co. 300
Timken Roller Bearing Co., The ..... Back Cover
Tomkins-Johnson Co., The 242
Torrington Co., The, The Progressive Mfg. Co. Division 314
Torrington Manufacturing Co., The 230
Towmotor Corporation 34, 35
Townsend Co. 280

Union Carbide Corporation, Electro Metallurgical Division 33
Union Carbide Corporation, Haynes Stellite Division 256
United Engineering & Foundry Co. 249
United States Rubber Co., Mechanical Goods Division 181
United States Steel Corporation, Subsidiaries 25, 26, 27, 28, 74, 75, 113, 234, 235
United States Steel Export Co. 25, 26, 27, 74, 75, 113
United States Steel Supply Division, United States Steel Corporation 25, 113
Universal Atlas Cement Division, United States Steel Corporation 28

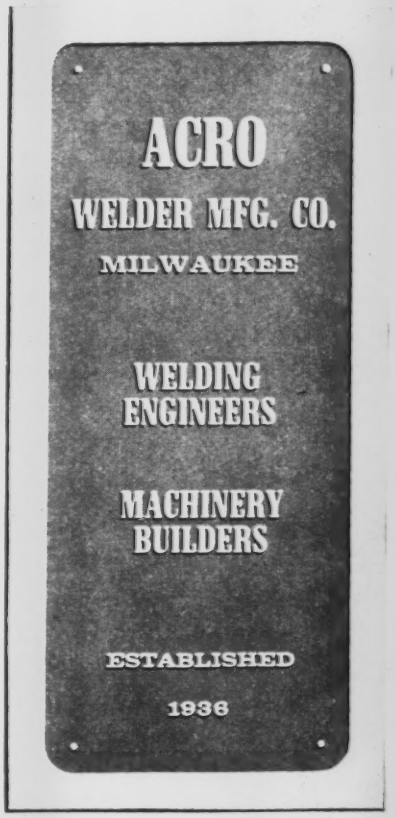
Vanadium Corporation of America 274, 275

Wales-Strippit Co. 278
Wall Tube & Metal Products Co. 138
Wallingford Steel Co., The 206
Ward Steel Co. 323
Washburn Wire Co. 107
Webb Corporation, The 288
West Penn Power, Area Development Department 114
Wheeling Steel Corporation 309
Wheelock, Lovejoy & Co., Inc. 215
Whitehead Metal Products Co., Inc. 12
Wickwire Spencer Steel Division, The Colorado Fuel & Iron Corporation 105
Wisconsin Motor Corporation 251
Wyckoff Steel Co. 142

Yale & Towne Manufacturing Co., The 116
Yoder Co., The 6, 95
Youngstown Sheet & Tube Co., The 11

Table of Contents, Page 5

Classified Advertising, Page 321



WARD STEEL CO.

We specialize in
FINISHED STEEL BARS—TUBES—STRIP

PROMPT WAREHOUSE SERVICE ONLY

Most Complete Stock in America of
BLUE TEMPERED SPRING STEEL

We believe that the way to sell is to carry a stock which permits satisfying any reasonable warehouse demand.

87A Rindge Ave. Ext. Phone UN 4-2460
CAMBRIDGE 40, MASS.

Branch:
3042-3058 W. 51st Street, CHICAGO, ILL.
Phone: Grovehill 6-2600

Allison-Campbell

ABRASIVE CUTTING KNOW-HOW

ACCO for Better Values

WHEEL EDGES TELL THE STORY!

NORMAL • *The right abrasive cutting wheel, properly applied, produces edges like these:*

Slightly rounded edge is a sign of the right wheel properly applied to the cutting of solid bar stock up to 12 inches square. You'll get fast cutting and long wheel-life with the right abrasive cutting wheel.

A wheel which retains its **square edge** is well-suited to cutting both—solids, and structurals or tubing of medium wall thickness. A good general-purpose wheel is required for these mixed cutting operations.

This **edge** is **slightly concave.** It should appear this way when you've used the right wheel to cut light tubing or other thin-wall sections. ALLISON wheels designed for this application make burr negligible.

ABNORMAL • *The wrong wheel, or improper application, produces edges like these:*

A **slightly pointed edge** means a wheel mismatched to the cutting job. A wheel which looks like this is too hard, doesn't break down uniformly. The tapering effect can produce wheel binding and breakage, and can burn the cut.

A **"chisel" edge** shows uneven wear, faster breakdown of the wheel on one side than on the other. It's the result of improper application of coolant in wet cutting. The result—shorter wheel life, and crooked cuts.

When the abrasive grain on the wheel edge wears smooth without being torn out, the **edge** becomes **"glazed,"** and the wheel loses its cutting efficiency. This condition is easily avoided by proper wheel application.

Abrasive Cutting Can Give You CLEANER Cuts—Faster

Cutting speeds of a few seconds per square inch, on almost *any* material, mean substantial time savings. Even titanium can be cut quickly and economically with the right abrasive cutting machine and wheel.

Fine finish obtained from abrasive cutting avoids burn, minimizes burr, and reduces or eliminates additional finishing operations.

Accuracy of CAMPBELL machines permits cutting within the closest tolerances, reduces rejects and scrap loss.

A complete selection of machines and wheels for *any* cut-off application is offered by ALLISON-CAMPBELL. Four types of CAMPBELL machines—chop stroke, oscillating, horizontal, and rotary—in capacities from the smallest stock to 14″ rounds . . . billets up to 12″ square . . . plate up to 6″ thick and 20 ft. long. ALLISON wheels—more than 150 different specifications—rubber or resinoid bond —3″ to 34″ diameters—.006″ to 3/16″ thick.

Application help is available from your ALLISON-CAMPBELL Field Engineer. His know-how is your assurance of the efficient, accurate, and economical cutting you can expect from modern abrasive cutting techniques. Call on him for expert advice.

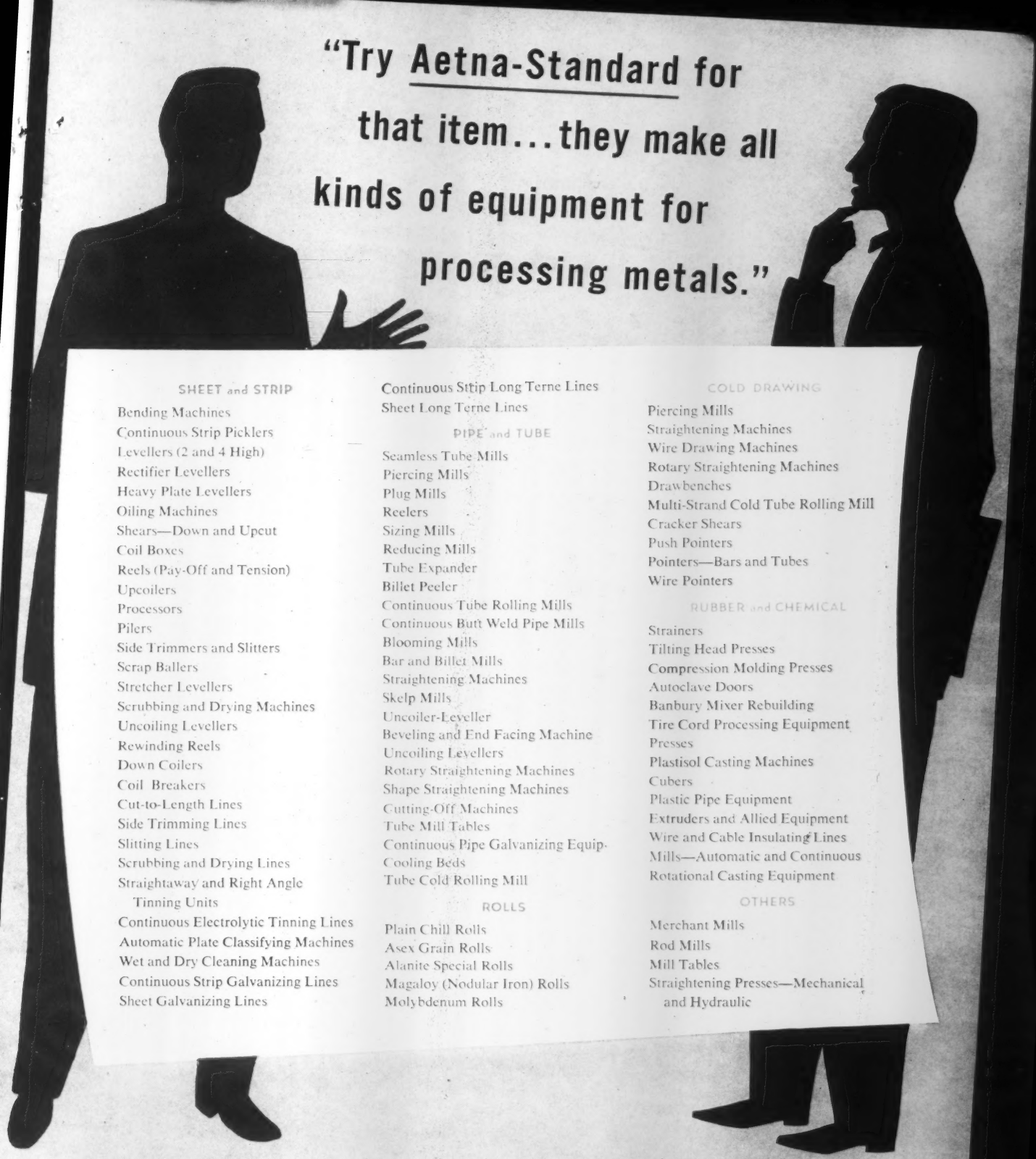
WRITE FOR NEW BULLETIN

ALLISON-CAMPBELL Division has a modern, fully equipped Demonstration Laboratory in which your own cutting problems can be analyzed. Write for a copy of DH-20, a new bulletin describing these services. Details on ALLISON Abrasive Cutting Wheels and CAMPBELL Machines are also available.

ALLISON-CAMPBELL DIVISION
AMERICAN CHAIN & CABLE

921 Connecticut Avenue, Bridgeport 2, Conn.

ACCO



"Try Aetna-Standard for that item... they make all kinds of equipment for processing metals."

SHEET and STRIP

Bending Machines
Continuous Strip Picklers
Levellers (2 and 4 High)
Rectifier Levellers
Heavy Plate Levellers
Oiling Machines
Shears—Down and Upcut
Coil Boxes
Reels (Pay-Off and Tension)
Upcoilers
Processors
Pilers
Side Trimmers and Slitters
Scrap Ballers
Stretcher Levellers
Scrubbing and Drying Machines
Uncoiling Levellers
Rewinding Reels
Down Coilers
Coil Breakers
Cut-to-Length Lines
Side Trimming Lines
Slitting Lines
Scrubbing and Drying Lines
Straightaway and Right Angle Tinning Units
Continuous Electrolytic Tinning Lines
Automatic Plate Classifying Machines
Wet and Dry Cleaning Machines
Continuous Strip Galvanizing Lines
Sheet Galvanizing Lines
Continuous Strip Long Terne Lines
Sheet Long Terne Lines

PIPE and TUBE

Seamless Tube Mills
Piercing Mills
Plug Mills
Reelers
Sizing Mills
Reducing Mills
Tube Expander
Billet Peeler
Continuous Tube Rolling Mills
Continuous Butt Weld Pipe Mills
Blooming Mills
Bar and Billet Mills
Straightening Machines
Skelp Mills
Uncoiler-Leveller
Beveling and End Facing Machine
Uncoiling Levellers
Rotary Straightening Machines
Shape Straightening Machines
Cutting-Off Machines
Tube Mill Tables
Continuous Pipe Galvanizing Equip.
Cooling Beds
Tube Cold Rolling Mill

ROLLS

Plain Chill Rolls
Asex Grain Rolls
Alanite Special Rolls
Magaloy (Nodular Iron) Rolls
Molybdenum Rolls

COLD DRAWING

Piercing Mills
Straightening Machines
Wire Drawing Machines
Rotary Straightening Machines
Drawbenches
Multi-Strand Cold Tube Rolling Mill
Cracker Shears
Push Pointers
Pointers—Bars and Tubes
Wire Pointers

RUBBER and CHEMICAL

Strainers
Tilting Head Presses
Compression Molding Presses
Autoclave Doors
Banbury Mixer Rebuilding
Tire Cord Processing Equipment
Presses
Plastisol Casting Machines
Cubers
Plastic Pipe Equipment
Extruders and Allied Equipment
Wire and Cable Insulating Lines
Mills—Automatic and Continuous
Rotational Casting Equipment

OTHERS

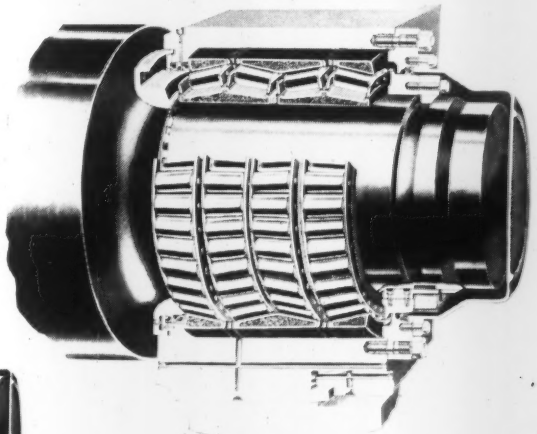
Merchant Mills
Rod Mills
Mill Tables
Straightening Presses—Mechanical and Hydraulic

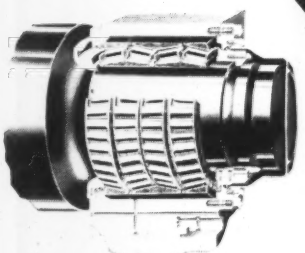
AETNA • STANDARD

THE AETNA-STANDARD ENGINEERING COMPANY

GENERAL OFFICES: PITTSBURGH, PA. • PLANTS: ELLWOOD CITY, PA., WARREN, OHIO • RESEARCH LABORATORY: AKRON, OHIO

TIMKEN® bearings used on rolling mill roll necks





1933
45 mills

1950
317 mills

1958
1,008 mills

Look how this idea has grown in 25 years!

JUST 25 years ago—in 1933—there were 45 mills using Timken bearing-equipped stands. Today, 2,436 Timken bearing-equipped stands are used in 1,008 mills . . . more than 22 times as many mills as in 1933.

Why has the idea of using Timken® tapered roller bearings on mill roll necks become so widely adopted? For all these reasons:

1. LOW BEARING COST. Tonnage records indicate that the long life of Timken roll neck bearings keeps bearing costs per ton of steel rolled to a minimum.

2. GREATER MILL RIGIDITY. Balanced proportion design of Timken bearings permits larger roll necks than ever before possible with tapered roller bearings.

3. ELIMINATION OF COMPLICATED LUBRICATING SYSTEMS. Timken bearings permit use of simple grease lubrication.

4. LOAD RATINGS INCREASED UP TO 40% due to Timken bearings' balanced proportion design.

5. NO SPECIAL THRUST BEARINGS NEEDED. Timken tapered roller bearings take both radial and thrust loads.

6. MILLS CAN BE STOPPED AND RESTARTED WITH NO LOSS OF STEEL. Timken bearings permit starting under full load.

7. HIGHER ROLLING MILL SPEEDS are possible because Timken bearings minimize friction.

8. PROLONGED ROLL LIFE is assured because Timken bearings provide maximum roll neck strength, less wear.

You can be sure of all these advantages in either existing or new equipment by specifying Timken tapered roller bearings for back-up and work rolls. Consult our roll neck bearing specialists for full details. Write The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

TIMKEN ROLLER BEARING EQUIPPED

This symbol on a product means its bearings are the best.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS ROLL THE LOAD